Chemical Age

Aromatic Intermediates Up-to-date
(page 93)

VOL. 78 No. 1984

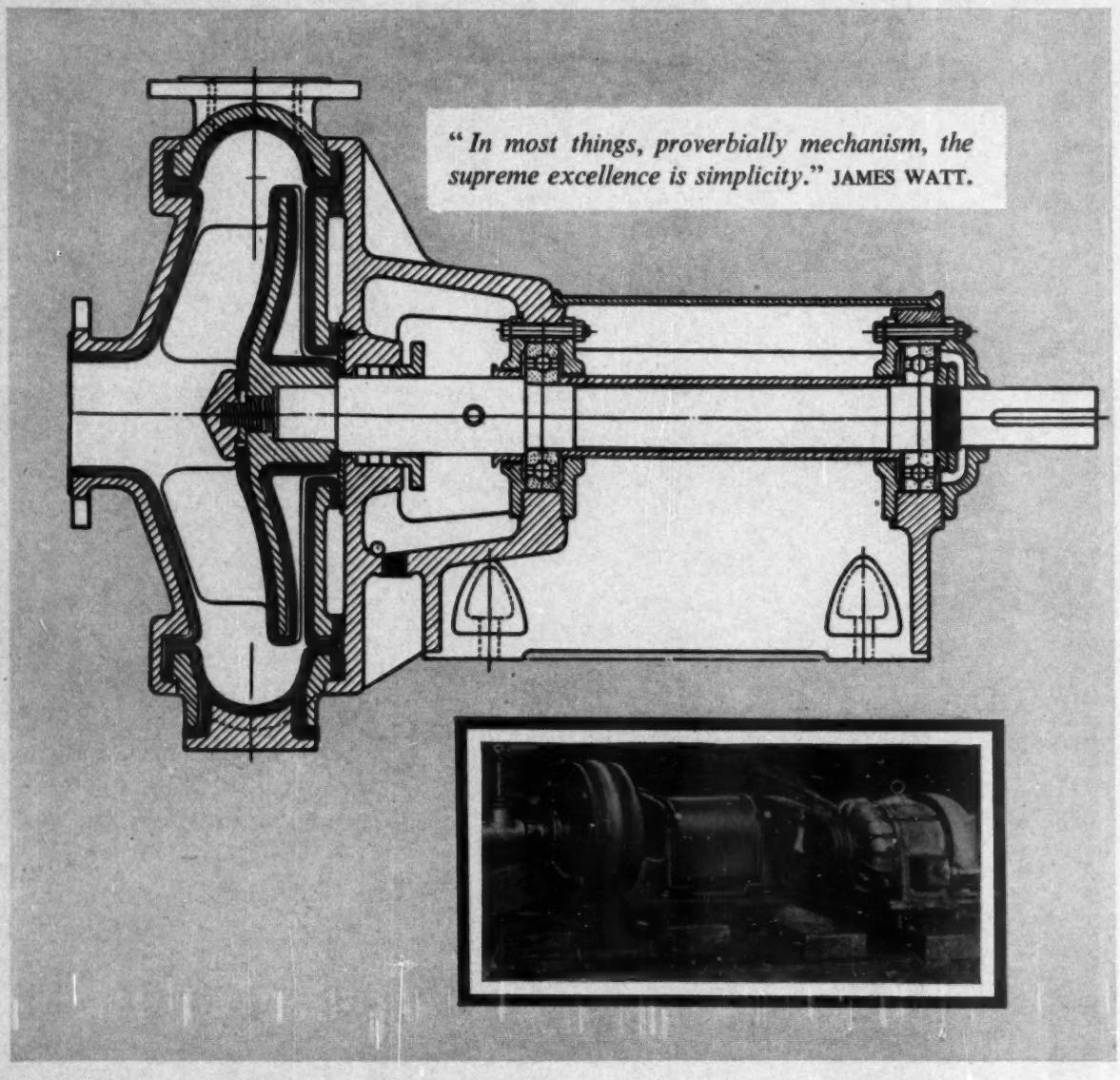
20 July 1957

It's

"Metal Containers" Age

METAL CONTAINERS LTD., 17 WATERLOO PLACE, PALL MALL, LONDON

WORKS: ELLESMERE PORT & RENFREW. ASSOCIATED COMPANIES OVERSEAS



The Vacseal Pump is the simplest solids handling pump yet devised

- No Gland problem • No sealing water required
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- Delivery against heads up to 100'. Suction lift 12'
- Standard rubber-lined for abrasive pulps and slurries; special rubber-lined for acids and other corrosive liquors
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INTERNATIONAL COMBUSTION PRODUCTS LIMITED

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ACETONE

ISOPROPYL ALCOHOL

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Availability:

These high quality chemicals, manufactured at Billingham from propylene produced in the oil-cracking plant at Wilton, are available in road tank-wagons and drums. Stocks are maintained at convenient distribution centres for prompt delivery to all parts of the country.

For further information, consult:

IMPERIAL CHEMICAL INDUSTRIES LTD.

LONDON, S.W.1.

B149

INDEX TO ADVERTISERS

The first figures refer to advertisement in **Chemical Age Year Book**, *the second to the current issue*

Page		Page
229	A.P.V. Co., Ltd., The	—
344	Acalor (1948) Ltd.	—
209	Accrington Brick & Tile Co., Ltd., The	—
176	Adequate Weighers Ltd.	—
	Aero Research Ltd.	—
223	Aimer Products Ltd.	—
159	Albany Engineering Co. Ltd., The	—
	Alexander, Herbert, & Co., Ltd.	—
165	Allen, Edgar, & Co., Ltd.	—
364	Alumina Co., Ltd., The	—
328	Amalgamated Oxides (1939) Ltd.	—
306	Armour & Co., Ltd.	—
G/Cd.	Ashmore, Benson, Pease & Co.	—
189	Ashworth, Arthur, Ltd.	—
	Associated Lead Mfrs. Ltd.	—
G/Cd.	Audley Engineering Co., Ltd.	—
146	Autometric Pumps Ltd.	—
212	B. A. Holland Engineering Co., Ltd., The	—
282	Baker Perkins Ltd.	—
324	Baker Platinum Division, Engelhard Industries Ltd.	—
233	Balfour, Henry, & Co.	—
210	Barclay Kellett & Co., Ltd.	—
250	Bennett, Sons & Shears Ltd.	—
G/Cd.	Berk, F. W. & Co., Ltd.	—
242	Beryllium & Copper Alloys (Safety Tools) Ltd.	—
	Bivac Air Co. Ltd.	—
270	Black, B., & Son, Ltd.	—
2	Blackman Keith Ltd.	—
204	Blundell & Crompton Ltd.	80
148	Borax Consolidated Ltd.	—
	Borax & Chemicals Ltd.	—
289	Boulton, William, Ltd.	—
228	Bowmans Chemicals Ltd.	—
270	Braby, Fredk., & Co., Ltd.	—
183	Bramigk & Co., Ltd.	—
	British Acheson Electrodes Ltd.	—
224	British Arca Regulators Ltd.	—
217	British Carbo Norit Union Ltd.	—
	British Ceca Co., Ltd., The	—
216	British Chrome & Chemicals Ltd. (London)	—
230	British Chrome & Chemicals Ltd. (Lancs)	—
	British Drug Houses Ltd., The	84
	British Geon Limited	—
8	British Industrial Solvents	—
236 & 237	British Laboratory Ware Association Ltd.	—
275	British LaBour Pump Co., Ltd.	—
240	British Lead Mills Ltd.	—
360	British Railway Traffic & Electric Co., Ltd.	—
Spine	British Resin Products Ltd.	—
172	British Rototherm Co., Ltd., The	—
227	British Steam Specialties Ltd.	—
168	British Tar Products Ltd.	90
	British Thomson-Houston Co. Ltd.	81
170	British Titan Products Co., Ltd.	—
397	Broadbent, Thomas, & Sons, Ltd.	—
231	Brotherhood, Peter, Ltd.	—
244	Brotherton & Co., Ltd.	—
	Brough, E. A., & Co., Ltd.	—
234	Browns Foundry Co., Ltd.	—
218	Brush Design Group, The	—
175	Bryan Donkin Co., Ltd., The	cov. iv
180	Buell (1952) Ltd.	—
272	Burnett & Rolfe Ltd.	—
	Buss Ltd.	—
	Butterworths Scientific Publications	—
201	Butterfield, W. P., Ltd.	—
160	Calder Vale Glassworks Ltd.	—
	Callow, F. E. (Engineers) Ltd.	—
	Callow Rock Lime Co. Ltd., The	—
354	Candy Filter Co., Ltd., The	—
	Cannon (G. A.) Ltd.	—
238	Carbon Dioxide Co., The	—
280	Carmichael, John R., Ltd.	—
243	Catalin Ltd.	—
	Chapman & Hall Ltd.	—
	Chemical Construction (Great Britain) Ltd.	—
191	Chemical Workers' Union, The	—
	Chemicals & Feeds Ltd.	—
318	Chemitrade Ltd.	116
284	Chesterfield Tube Co., Ltd., The	—
203	Ciech (Poland)	cov. iii
264	Cinema Television Ltd.	—
224	Clark, T. C., & Co., Ltd.	—
	Classified Advertisements	114, 115, 116
258	Clayton Dyestuffs Co. Ltd., The	—
199	Clayton, Son & Co., Ltd.	—
288	Clydesdale Chemical Co. Ltd.	—
285	Clyde Tube Forgings Ltd.	—
213	Cole, R. H., & Co., Ltd.	—
208	Cole & Wilson Ltd.	—
204	Collins Improved Firebars Ltd.	—
	Colt Ventilation Ltd.	—
	Colvin-Smith Ltd.	—
348	Comet Pump & Eng. Co. Ltd., The	—
	Constable & Co.	—
	Controlled Convection Drying Co.	—
	Costain-John Brown Ltd.	—
4	Crofts (Engineers) Ltd.	—
	Cromil & Piercy Ltd.	—
171	Cruickshank, R., Ltd.	—
334	Curran, Edward, Engineering Ltd.	—
304	Cyanamid Products Ltd.	—
222	Cyclops Engineering Co. Ltd., The	—
288	Cygnet Joinery Ltd.	—
286	Danks of Netherton Ltd.	—
216	Davey, Paxman & Co., Ltd.	—
	Dawson, McDonald & Dawson Ltd.	116
170	Derby Luminescents Ltd.	—
161	Dorr-Oliver Co., Ltd.	—
280	Douglas, William, & Sons Ltd.	—
200	Dowlow Lime & Stone Co., Ltd., The	—
	Dring & Fage Ltd.	—
174	Drummond Patents Ltd.	—
195	Dryden, T., Ltd.	82
	Dunlop Rubber Co., Ltd.	—
	Dutt, P. K., & Co., Ltd.	—
232	E.D.C., Ltd.	—
330	Edison Swan Electric Co., Ltd., The	—
	Electric Resistance Furnace Co. Ltd.	—
268	Electronic Switchgear (London) Ltd.	—
244	Electrothermal Engineering Ltd.	—
B/Mk.	Elliott, H. J., Ltd.	—
	Emcer Products	84
	Enamelled Metal Products Ltd.	—
166	English Glass Co., Ltd., The	—
G/Cd.	Erinoid Ltd.	—
207	Evered & Co., Ltd.	—
	Fairey Aviation	113
280	Farnell Carbons Ltd.	—
	Fawcett Finney Ltd.	—
202	Ferris, J. & E., Ltd.	—
	Fleischmann (London) Ltd.	—
220	Film Cooling Towers (1925) Ltd.	—
253	Foxboro-Yoxall Ltd.	—
	Fraser, W. J., & Co., Ltd.	—
298	Fuller's Earth Union Ltd., The	—
188	Gallenkamp, A., & Co., Ltd.	—
	Gas Council, The	—
266	Geigy Pharmaceutical Co., Ltd.	—
	General Electric Co., Ltd.	—
	Glebe Mines Limited	—
	Goodyear Chemical Co.	—
290	Graviner Mfg. Co., Ltd.	—
265	Grazebrook, M. & W., Ltd.	—
164	Greeff, R. W., & Co., Ltd.	—
192	Grindley & Co., Ltd.	—
232	Hackbridge & Hewittic Electric Co., Ltd.	—
202	Haller & Phillips Ltd.	88
214	Hanovia Lamps	—
	Hanson Books	—
206	Harris (Lostock Gralam) Ltd.	111
222	Haworth, F. (A.R.C.) Ltd.	—
158	Hearson, Charles, & Co., Ltd.	—
238	Herbert, Alfred, Ltd.	—
	Hickson & Welch Ltd.	—
193	Holroyd, John, & Co., Ltd.	—
234	Honeywill & Stein Ltd.	—
248	Hopkin & Williams Ltd.	—
187	Humphreys & Glasgow Ltd.	—
310	Huntington, Heberlein & Co. Ltd.	—
310	I.C.I. Billingham Organic	77
	I.C.I. General Chemicals Florube	—
	I.C.I. Plastics—Darvic	87
	I.C.I. Plastics—Fluon.	83
	I.C.I. Ltd., (Plastics Div.) Corvic	—
	Imperial Chemical Industries Ltd.	—

continued on page 80

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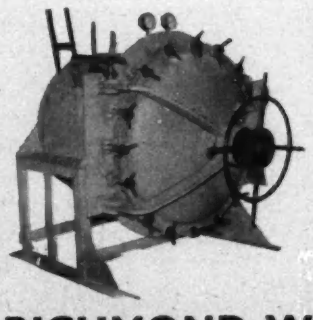

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3-day Conference pronounces 'Hydrazine great success'

British Power Station Chemist said...

Hydrazine

The chemical properties (see paragraph 6) of this compound indicate that hydrazine would offer a solution to most of the problems and have obvious advantages over the conventional sodium sulphite.

Summary of Experience at Station "A"

In view of the extremely satisfactory results of our investigations, hydrazine is now a permanent feature of the feed water conditioning at this Station. The introduction of this form of feed water treatment has resulted in :—

(a) greater boiler availability
(b) reduced feed line corrosion
(c) complete removal of oxygen
(d) elimination of boiler blow down
(e) less chemical treatment

Prior to the treatment of these units with hydrazine, tube failures occurred at fairly frequent intervals. These boilers now run from one boiler insurance inspection to the other, and but for the mandatory regulations even longer periods than 14 months continuous use without blow down could be obtained.

Conclusion

The experiences with hydrazine treatment given in this paper cover boilers operating at 600, 900 and 1,500 lb/sq. in., and in all cases proof has been obtained that this reagent is an efficient deoxidant.

Boilers treated with this deoxidant are more efficient, cleaner, have increased availability and there is no loss of heat or chemicals through blowdown. Feed line corrosion is considerably reduced and corrosion of feed heaters has been arrested.

American Chemical Engineer said...

Hydrazine is now established in the United States as a proved and valuable chemical in certain applications for the treatment of industrial water. Basically its function is to remove dissolved oxygen, or to inhibit the pitting-type of corrosion which is associated with dissolved oxygen in water used for industrial purposes.

1. Hydrazine treatment had been used continuously in one or more boilers for 2½ years, and it is the only chemical treatment used by Duke Power Company in boilers operating at pressures above 900 p.s.i.g. At that time hydrazine was being used in 16 steam generating units at operating pressures ranging from 450 to 1850 p.s.i.g. producing steam for a total turbogenerator continuous capability of 1,170,000 kw.
2. Corrosion which was causing tube failure in boilers operating at 1350 p.s.i.g. had been arrested.
3. No undesirable results had been observed from this use of hydrazine.
4. A typical hydrazine residual is 0·10 ppm. N_2H_4 in the boiler water.
5. Dilute solutions of hydrazine require no more handling precautions than solutions of other chemicals commonly used in boiler water treatment.

German Scientist said...

The original reason determining the use of hydrazine as compared to other reagents was the fact that during degassing in high pressure boilers it does not leave any residual solids. Furthermore, hydrazine does not form any harmful products.

As the product is volatile in steam, it is possible, according to operating conditions, to extend the protection to the whole water-steam circulation system.

Hydrazine has a further advantage in that at ordinary temperatures it is stable in the presence of oxygen. Therefore control is simple.

Experiences obtained up till now are so favourable that, for example, the Hamburg-America Line has decided to fit all its turbine ships with hydrazine dosing equipment.

These, together with many other tributes, were included in lectures given at the recent International Hydrazine Conference organised by Whiffen & Sons Ltd.

It is to your advantage to know how Hydrazine can safeguard *your* boilers against corrosion. Why not write to us today?

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INDEX TO ADVERTISERS

The first figures refer to advertisement in **Chemical Age Year Book**, *the second to the current issue*

Page		Page
157	Imperial Smelting Corporation (Sales) Ltd.	—
	Industrial & Marine Protective Applications Limited	—
	International Combustion Group	cov. ii
	Isopad Ltd.	—
246	Jackson, Henry (Liverpool) Ltd.	—
214	Jackson, J. G., & Crockatt Ltd.	—
245	Jenkins, Robert, & Co., Ltd.	—
249	Jenkinson, W. G., Ltd.	—
3	Jobling, James A., & Co., Ltd.	—
	Johnson, S. H., & Co., Ltd.	—
166	Johnsons of Hendon Ltd.	—
267	Jones, Tate & Co., Ltd.	—
228	K.D.G. Instruments Ltd.	—
178	K. W. Chemicals Ltd.	—
	Kaylene (Chemicals) Ltd.	—
278	Kernick & Son Ltd.	—
395	Kestner Evaporator & Engineering Co., Ltd.	cov. iv
395	Kestner Evaporator & Engineering Co., Ltd. (*Keebush*)	—
	Kestner (Industrial Safety) Ltd.	80
	Key Engineering Co., Ltd., The	—
283	Kier, J. L., & Co., Ltd.	—
271	Kleen-e-ze Brush Co., Ltd.	—
206	Lankro Chemicals Ltd.	—
210	Laporte Chemicals Ltd.	82
184	Lavino (London) Ltd.	—
252	Leda Chemicals Ltd.	—
264	Leek Chemicals Ltd.	—
162	Leigh & Sons Metal Works Ltd.	78
	Lennig, Charles, & Co. (Great Britain) Ltd.	—
	Lennox Foundry Co., Ltd.	—
219	Light, L., & Co., Ltd.	—
274	Lind, Peter, & Co., Ltd.	—
Cover	London Aluminium Co. Ltd., The	—
	Longman Green & Co., Ltd.	—
278	Lord, John L., & Son	—
190	Machinery (Continental) Ltd.	—
257	Mallinson & Eckersley Ltd.	—
	Manesty Machines	—
342	Marchon Products Ltd.	—
226	Marco Conveyor & Eng. Co. Ltd.	—
168	Matthews & Yates Ltd.	—
	May & Baker Ltd.	—
173	Measuring & Scientific Equipment Ltd.	—
	Meigh Castings Ltd.	—
Cover	Metal Containers Ltd.	Front cov.
	Metalfiltration Co., Ltd.	—
G/Cd.	Metalock (Britain) Ltd.	—
174	Metcalf & Co.	—
	Metropolitan-Vickers Electrical Co., Ltd.	—
178	Middleton & Co., Ltd.	—
	Mills Packard Construction Co., Ltd.	—
215	Mine Safety Appliances Co. Ltd.	—
	Mirrless Watson & Co. Ltd., The	—
180	Mirvale Chemical Co., Ltd.	—
254	Mitchell Cotts & Co., Ltd.	—
	Mond Nickel Co., Ltd., The	—
	Monsanto Chemicals Ltd.	—
	Morgan Crucible Co., Ltd., The	—
200	Moritz Chemical Engineering Co., Ltd.	90
181	Neckar Water Softener Co. Ltd.	—
268	Nederlandse Emballage Ondeernemming Gebr. de Wilde N.V.	—
221	Negretti & Zambra Ltd.	85
	New Metals & Chemicals Ltd.	—
	Newnes, George Co., Ltd.	—
276 & 277	Newton Chambers & Co. Ltd.	—
239	Nicolson, W. B. (Scientific Instruments) Ltd.	—
177	Nordac Ltd.	89
211	North Thames Gas Board	—
194	Northern Malleable Foundry Co., Ltd., The	—
179	Northey Rotary Compressors Ltd.	—
	Nu-Swift Ltd.	—
296	Palfrey, William, Ltd.	—
	Paper Good Manufacturing Co., Ltd.	—
	Pascall Engineering Co. Ltd., The	84
6	Paterson Engineering Co. Ltd., The	—
287	Peabody Ltd.	—
	Penrhyn Quarries Ltd.	116
	Pergamon Press	—
320 & 368	Permutit Co., Ltd., The	—
G/Cd.	Petrocarbon Developments Ltd.	—
	Petrochemicals Ltd.	86
340	Pool, J. F., Ltd.	—
	Pott, Cassels & Williamson	—
358	Powell Duffryn Carbon Products Ltd.	—
G/Cd.	Power-Gas Corporation, Ltd., The	—
169	Price Stutfield & Co., Ltd.	—
	Prodorite Ltd.	—
242	Production Chemicals (Rochdale) Ltd.	—
261	Pye, W. G., & Co., Ltd.	—
	Pyrethrum Board of Kenya	—
	Q.V.F. Ltd.	—
314	Reads Ltd.	—
	Richmond Welding Co., Ltd.	78
	Robinson, F., & Co., Ltd.	—
G/Cd.	Rose, Downs & Thompson Ltd.	—
230	Rotometer Manufacturing Co. Ltd.	—
167	St. Helens Cable & Rubber Co. Ltd.	—
269	Sandiacre Screw Co. Ltd., The	—
182	Scientific Glass-Blowing Co., The	—
285	Shaw Petrie Ltd.	—
255	Sheepbridge Alloy Castings Ltd.	—
356	Shell Chemical Co., Ltd.	—
256	Siebe, Gorman & Co., Ltd.	—
350	Sigmund Pumps Ltd.	—
	Simon, Richard, & Sons, Ltd.	—
344	Southern Instruments Computer Division	—
338	Spencer Chapman & Messel Ltd.	—
	Stabilag Co., Ltd., The	—
396	Stanton Instruments Ltd.	—
	Staveley Iron & Chemical Co. Ltd.	—
212	Steel, J. M., & Co., Ltd.	—
	Stockdale Engineering Co., Ltd.	—
	Stonehouse Paper & Bag Mills	—
	Streamline Filters Ltd.	—
	Sturge, John & E., Ltd.	—
251	Sutcliffe Speakman & Co., Ltd.	—
279	Taylor Rustless Fittings Co., Ltd.	—
235	Tenaplas Sales Ltd.	—
218	Thermal Syndicate Ltd., The	—
196	Thomas & Bishop Ltd.	—
	Thomason, W., & Sons Ltd.	—
145	Thompson, John (Dudley) Ltd.	—
	Todd Bros. (St. Helens & Widnes) Ltd.	—
198	Towers, J. W., & Co., Ltd.	—
197	Trent Valve Co., Ltd.	—
160	Tungstone Products Ltd.	—
259	Unifloc Ltd.	—
	Unilever Ltd.	—
	United Coke & Chemicals Co. Ltd.	—
247	United Filters & Engineering Ltd.	—
	United Kingdom Atomic Energy Authority	—
	Vaughan Crane Co., Ltd.	—
192	W.E.X. Traders Ltd.	—
241	Walker Extract & Chemical Co. Ltd.	—
	Wallach Bros. Ltd.	—
263	Waller, George & Son Ltd.	—
161	Walley, A. L.	—
162	Wallis, Charles, & Sons (Sacks) Ltd.	—
	Ward, Thos. W., Ltd.	—
185	Watson, Laidlaw & Co., Ltd.	—
260	Wells, A. C., & Co., Ltd.	—
182	Wengers Ltd.	—
217	Whessoe Ltd.	—
	Whiffen & Sons Ltd.	79
196	Whitaker, B., & Sons Ltd.	—
163	Widnes Foundry & Engineering Co., Ltd.	—
	Wilkinson, James, & Son, Ltd.	—
186	Wilkinson Rubber Linatex Ltd.	—
273	Willcox, W. H., & Co., Ltd.	—
194	Williams, & James (Eng.) Ltd.	—
172	Wilson, Edward, & Son Ltd.	—
268	Wilde, Gebr. De Nederlandse Emballage Ondernemming N.V.	—
220	Wood, Harold, & Sons Ltd.	—
184	Worcester Royal Porcelain Co., Ltd., The	—
	Worthington-Simpson Ltd.	—
281	Wynn (Valves) Ltd.	—
225	Yorkshire Tar Distillers Ltd.	—
226	Zeal, G. H., Ltd.	—

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THE "OLDBURY" PATENT CARBOY DISCHARGER will empty and elevate up to 50 feet the contents of any carboy, bottle or vessel, and complies with all the conditions of the Factory Act of 1937

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5, Grosvenor Gardens, Westminster, London, S.W.1

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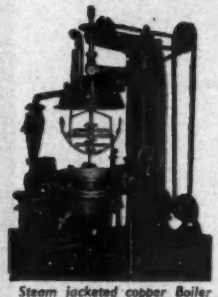
for the CHEMICAL TRADE



Steam jacketed copper Boiler and Mixer to tilt, with vacuum pump, and jet condenser. Cover and agitator raised by bevel gear and hand-wheel.

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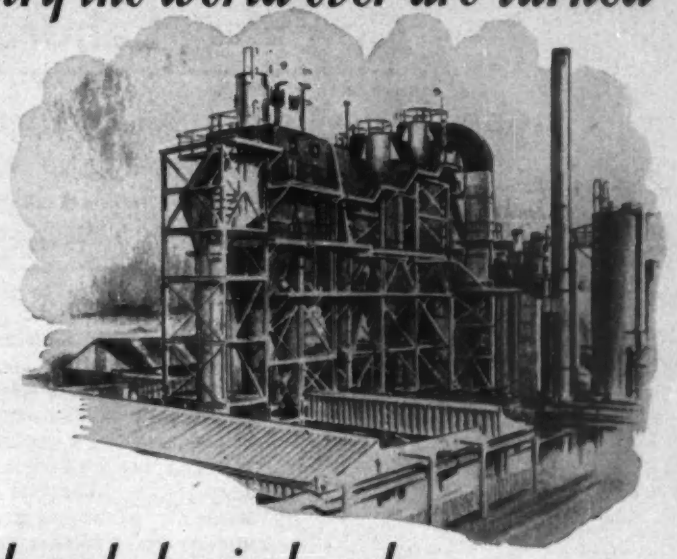
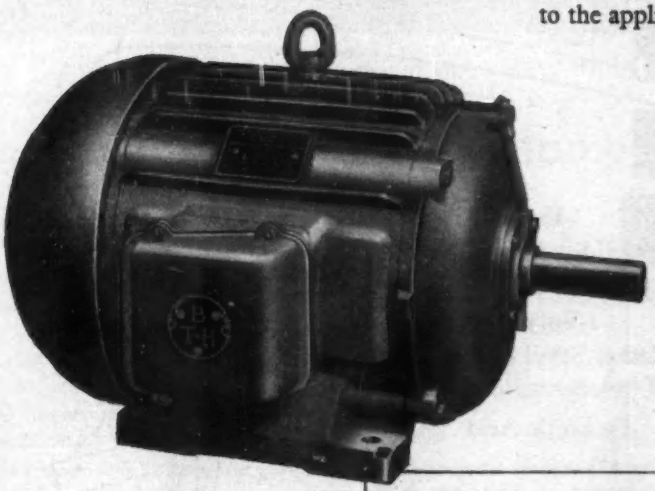


in the paint, varnish and chemical works

Whenever a power drive is needed, there is a BTH motor that will do the job efficiently and economically. In industries all over the world, BTH motors are helping to increase production. Over half-a-century's experience of this branch of electrical engineering enables BTH to offer the motor with the mounting, enclosure, rating and performance best suited to the application.



BTH factories are exceptionally well equipped to make both ***STANDARD*** *and* ***SPECIAL*** *machines in large quantities.*

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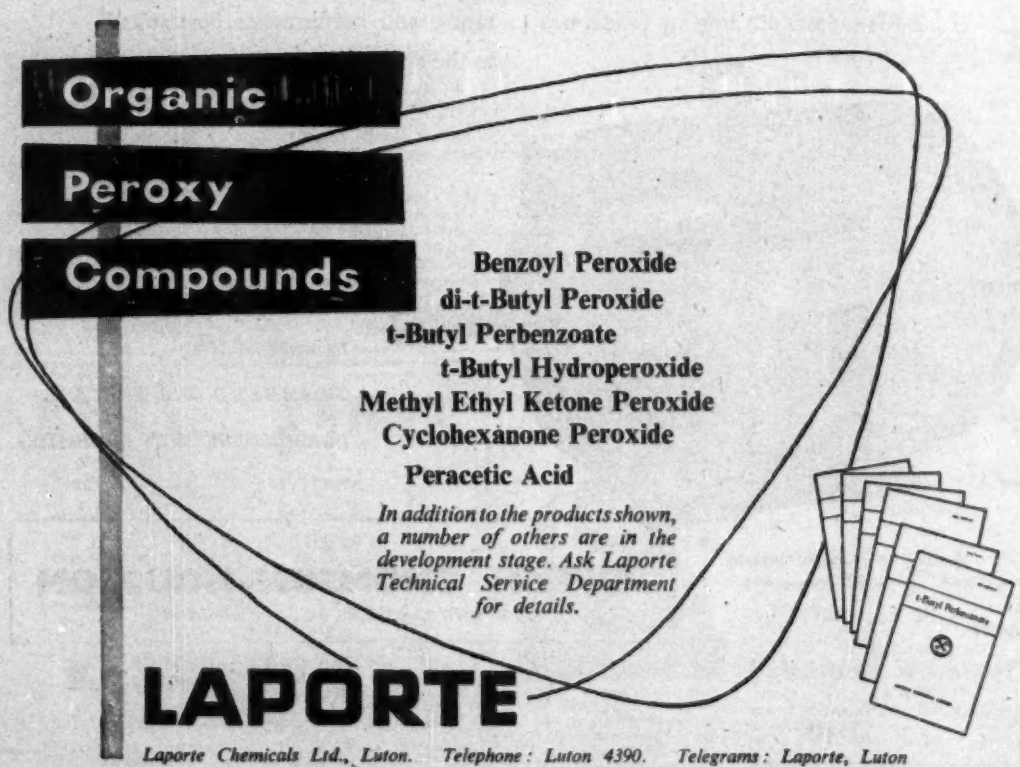
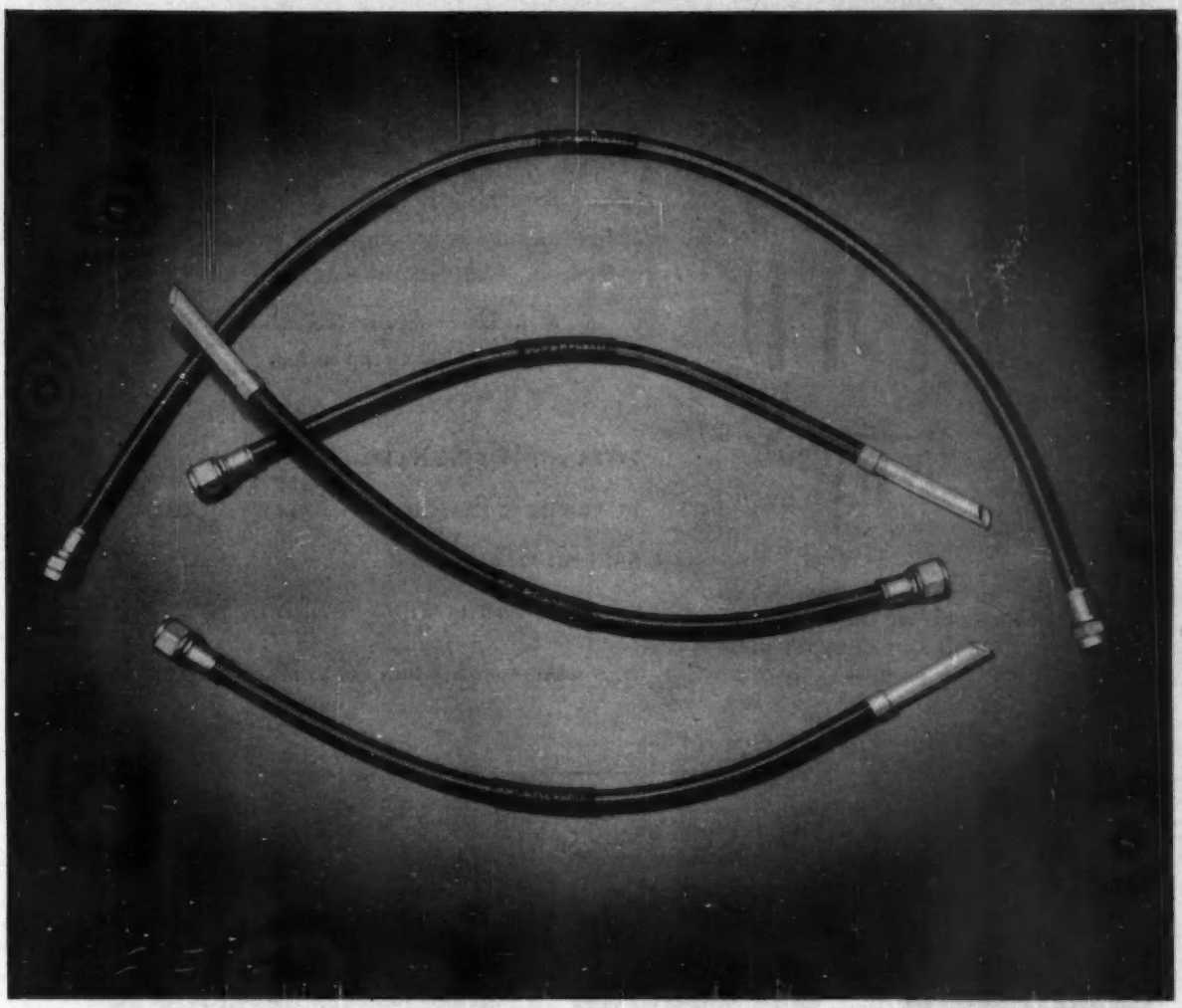


LAPORTE

Laporte Chemicals Ltd., Luton. Telephone: Luton 4390. Telegrams: Laporte, Luton



Reinforced Tubing made from 'Fluon' coagulated dispersion polymer by Superflexit Ltd., Slough, licensees of The Resistoflex Corp. Roseland, N. Jersey.

'Fluon' C.D.I. for reinforced flexible hose

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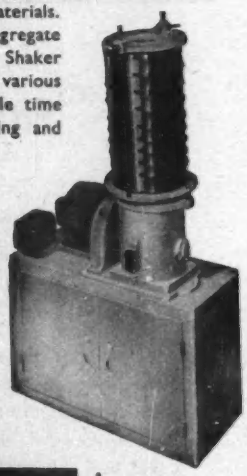

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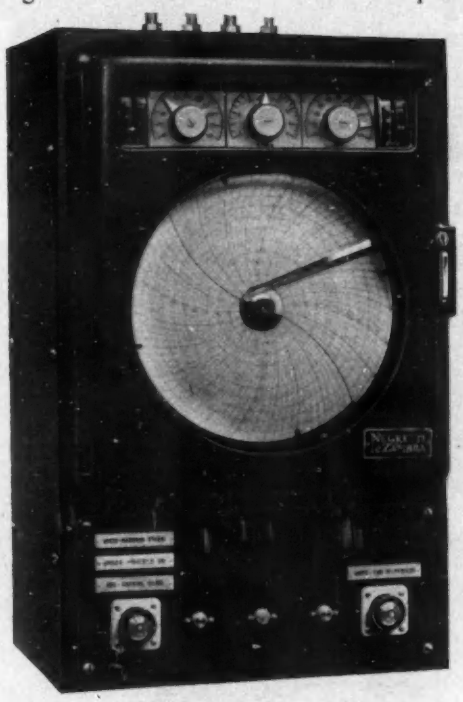

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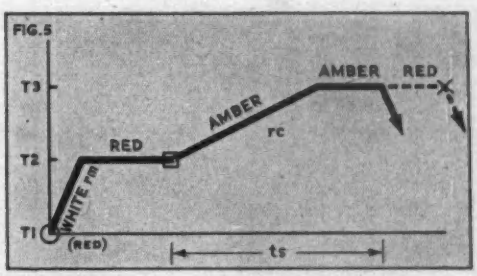

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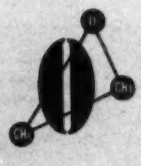

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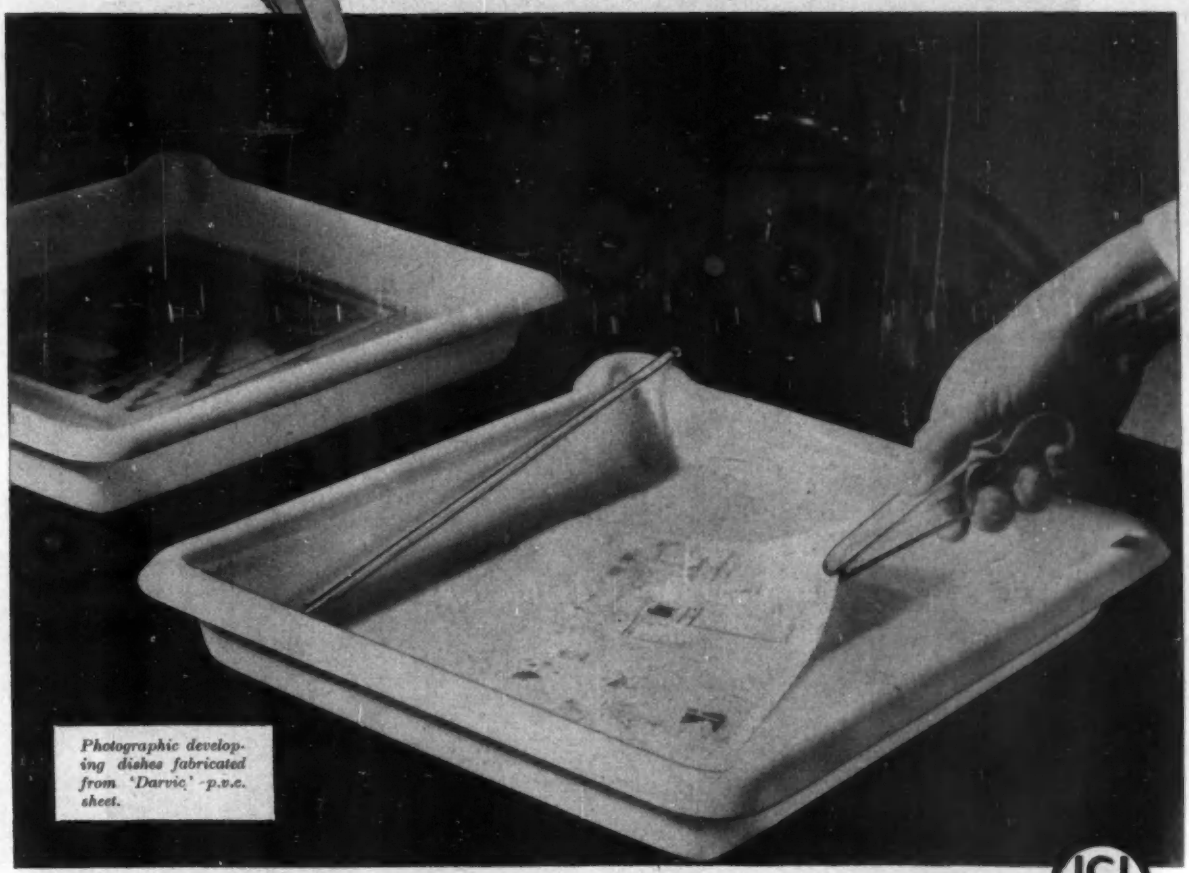

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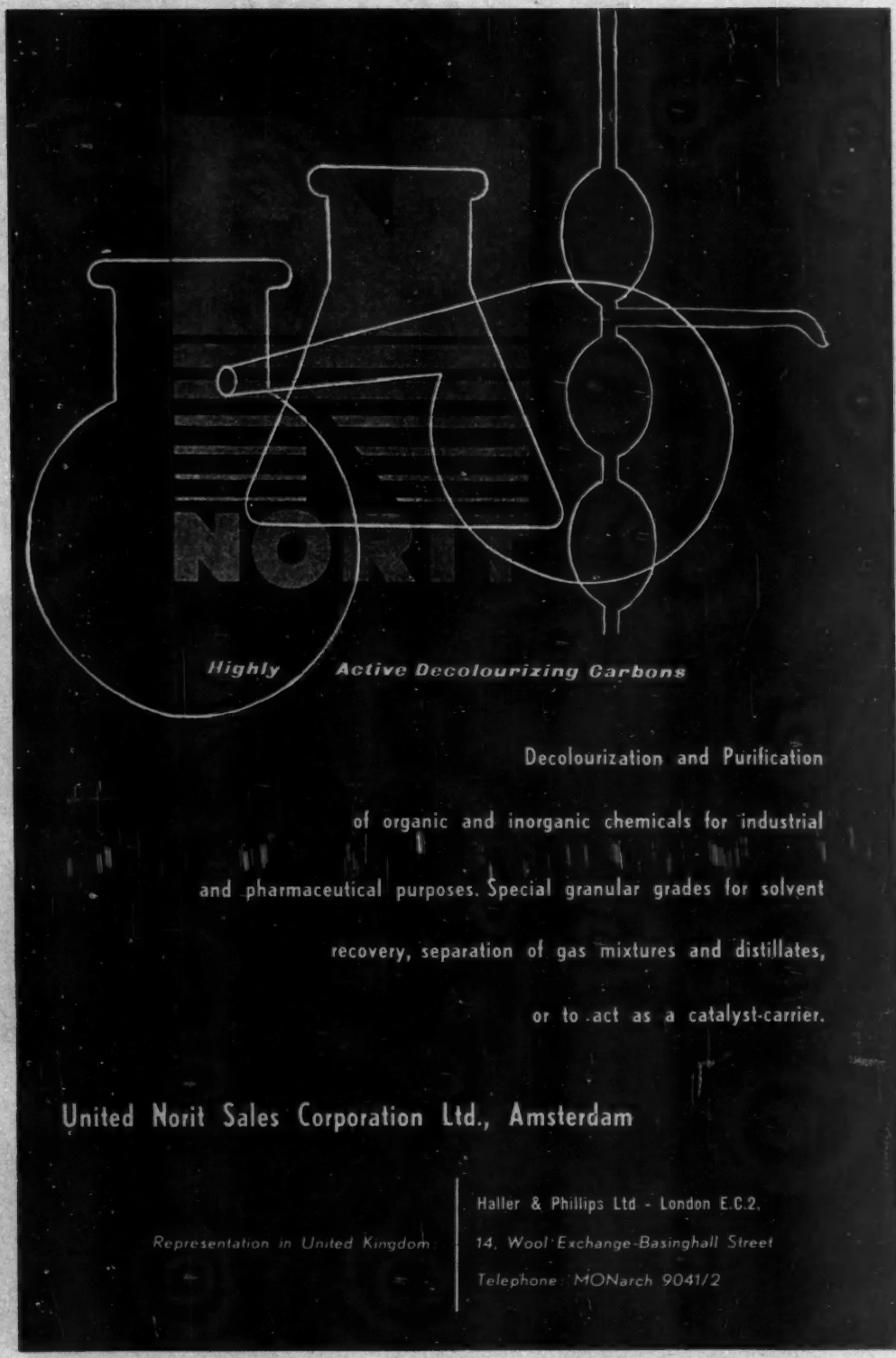
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IN THIS ISSUE

Sicilian Sulphur Industry	92
Bees and Insecticides	92
Aromatic Intermediates Reviewed	93
SCI Medal Address	94
Petrochemicals in OEEC Countries	95
Distillates	96
Plastics Convention	97
Gelatin Research Conference	98
Unique Sulphuric Acid Plant	99
In Parliament	100
Letter to the Editor	100
Automation in Analysis	101
Indian Newsletter	103
Overseas News	105
Chilean Nitrate Plan	106
25 Years of Tin Research	107
Chemist's Bookshelf	108
People in the News	110
Commercial News	111
Market Reports	111
New Patents	112
Trade Notes	112
Record SA Profits	113

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CHEMICAL AGE

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FAR EAST TRADE

IN RELAXING controls on trade with China, the UK has undoubtedly taken the lead. Almost immediately after the UK announcement, the US and French Governments made similar ones.

This lifting of restrictions on trade with China is a sensible step, particularly for the chemical industry. The door is now open to the largest undeveloped market in the world—a market serving 600 million people, which is lacking so much that the West can supply.

Throwing open the Chinese market means that the greatest expansion of trade will occur with that country. Britain has, with Norway, lifted the embargo on all chemicals to China except those barred to Russia and her satellites. This barred list of chemicals which is identical with that of other major NATO countries, covers most compounds of beryllium, chromium, cobalt, gold, indium, molybdenum, selenium, zirconium, gallium, germanium and radioactive materials. Vital war metals, explosives, certain plastics, silicones, glycols and derivatives naphthenates; oil additives are unlikely to be released from the present embargo. Most chemical commodities are, therefore, freely available to China and a particularly strong demand is expected for unrestricted items such as fertilisers, insecticides, herbicides, dyestuffs, pharmaceuticals and antibiotics.

Undoubtedly British chemical producers are enthusiastic about the relaxations. Chemical exports to China have been of the order of £1 million a year and should double in the next 12 months. By being first in the field to lift controls, Britain should have obtained a competitive lead. There is also the challenge of China's £67 million sterling reserves.

It is easily apparent that there will be competition for this Far East market. France has followed Britain's lead in favouring free trade with China, mainly in order to prevent this country gaining a monopoly in that market. However, in certain chemical items, France has not the capacity to export much and she is, of course, at present still concerned with her Algerian problems and unstable political situation. Fertilisers and pesticides are considered to be the main French exports to the Far East.

Germany, it is thought, is unlikely to enter the Far East market for a year. Chemical goods which will probably feature in Germany's exports to China are fertilisers, industrial chemicals and dyestuffs. In 1956, Germany had already increased her exports to China on allowed chemicals by 10 per cent.

Ministry sources in Japan have stated that the new Japanese Cabinet is expected to announce a formal decision very shortly to follow Britain's lead in relaxing restrictions in China trade to the same level as trade with Russia. The Japanese Ministry of International Trade and Industry has, in fact, started accepting applications to export over 200 items to Red China which were formerly banned but which are now authorised by Britain.

Some Japanese Ministry officials believe that Japan's exports to China might reach £36 million this year. Trade circles bearing in mind China's tight foreign exchange position, do not visualise a sharp increase in her exports (Japan could only profitably import coal from China). So far China's heaviest demand from Japan has been for unrestricted fertilisers, pesticides and pharmaceuticals. Likeliest Japanese exports to China are rubber compounding agents and synthetic

textile plant machinery. There is no doubt, however, that Japan will take advantage of freer trade with China.

What of the US? Following Britain's relaxation of controls upon trade with China, the US announced that restrictions placed on that country would be lessened, in line with the concessions already made in commercial dealings with the Soviet's European satellites. No US trade with China is legal now, but it is apparent that there is no advantage to the US to maintain a total embargo.

US chemical, fertiliser and pharmaceutical manufacturers, would definitely gain from any embargo relaxations. It is considered, though, that US policy is unlikely to be changed for at least a year as the US want to keep good diplomatic relations with small Far Eastern countries.

Having regard to all this Britain is in the strongest position to supply China's wants, and certainly would seem to have an overall lead. It is only right, however, to point out that a tremendous spurt in UK exports may not be realised as soon as might be hoped. China, with Russia as her support until now, may continue to trade with the Soviet and her associate countries even though all her needs cannot be met. China, like India, also has in hand a five-year plan in which, no doubt, Russia will assist. A further point is that while the UK can export to China, China's own administration may not be able to cope with the new situation.

Britain's chemical industry will undoubtedly not miss any opportunity of trading with China. At the same time attention must not be withdrawn from the other Eastern countries such as Burma, India and Pakistan.

These countries have long been the main UK markets in the East. But in both there are difficulties due mainly to shortage of currency. Announcements during the past few weeks by India's Premier indicate that considerable financial aid will be required from outside if the ambitious five-year plans for national expansion of production are to be realised.

Pakistan and India have had and will continue to have large loans, but the UK, in the field of private investment, holds an unchallenged position which will mean an expanding market for capital goods at first and consumer goods later on.

SICILIAN SULPHUR INDUSTRY

THERE have been various reports and announcements recently regarding the Sicilian sulphur industry (see CHEMICAL AGE, Overseas News section, June issues). It is apparent that all is not well with the industry and many suggestions are being made. The main problem is that of finding new sulphur beds.

A press campaign in favour of looking for new beds has been conducted recently by the Regional Co-ordination of Miners, belonging to CISL trade unions. Prospecting is certainly a new idea for the Sicilian sulphur industry for since early in the 20th century it has enjoyed practically a monopoly. In 1900, for instance, Sicily accounted for 80 per cent of the total output of sulphur, while 1905 was a record year with a total of 536,782 tons. However, after that year output has declined continuously due to competition from pyrites and to the discovery of extensive sulphur beds in Texas and Louisiana.

Mining in Sicily was of the surface type requiring no great effort for removal. In 1952, a special commission investigating sulphur production reported that in about 15 or 20 years, most of the existing sulphur mines would be exhausted. However, the Government in Rome placed at the disposal of the National Sulphur Board (Ente Zolfi Italiani) 950 million lire for prospecting, and of this sum, 770 million lire were reserved for Sicily. The local government in Palermo, at the same time also budgeted 3 million lire for the same purpose.

Ente Zolfi Italiani and the Palermo Assessonate of Industry working in conjunction with one another decided to ascertain the existence of possible extensions of the already exploited, or abandoned, beds and to compile a list of sites that were particularly likely to yield new sulphur beds.

It is unfortunate that this comparatively long-term policy should have coincided with a time when the Sicilian sulphur producers had surplus sulphur available. However, Sicily needs to find sulphur beds of the type which would permit recourse to the Frash method, and thus yield sulphur cheap enough to compete in the world market.

US companies have, of course, been interested in sulphur prospects in Sicily, in particular, the Texas Gulf Sulphur Co., which since 1954 has been prospecting for sulphur in Sicily over an area totalling 50,000 hectares. This undoubtedly indicates that this US company has expectations.

Information from Italy suggests that the Regional Co-ordination of Miners is relying on Ente Nazionali Idnocarburi. It will have been noted recently that this State-controlled institution has recently signed an agreement with the Palermo authorities whereby they received various areas totalling some 180,000 hectares in which to prospect for petroleum. President of ENI, Sig. Mattei has promised the Sicilians help in their sulphur difficulties. Since Sig. Mattei is considered energetic and resourceful, and also has the financial means to carry out the task of aiding the Sicilian sulphur industry, it is hoped that there will be interesting developments in Sicily before very long.

It has been suggested that a more realistic approach to rapid nationalisation and modernisation is required if Italian sulphur is to compete on level terms on the world market. The difficulties besetting the industry of heavy costs of producing elemental sulphur which exceed its sales value, could be overcome, it is believed, if there was a closer link-up with the users of Maremma pyrites, namely, the Italian iron and steel industry and Societa Montecatini with its cupreous pyrites residues from the company's copper extraction plant at Porto Marghera.

BEES AND INSECTICIDES

RECENTLY the County Councils Association has been concerned with permissible amounts of residues for fungicides and insecticides on fruits and vegetables. The association has suggested that regulations should prescribe permissable amounts of residues of such substances and that permitted chemicals should be specified.

It is not only the human being who suffers from toxic residues as a result of fungical or insecticidal sprays and dusts. A recently issued report of the Bee Disease Advisory Committee of the Ministry of Agriculture, Fisheries and Foods deals with nine reports of suspected poisoning accompanied by adequate samples of not less than 200 dead bees, which were received by the NAAS at Rothamstead, from beekeepers in England.

Tests were conducted on the samples for the presence of insecticidal materials and chemical evidence consistent with the presence of BHC was obtained from three samples. Two other samples yielded evidence of the presence of DNOC and dieldrin respectively.

In one case spraying of fruit blossom with BHC was suspected in orchards other than that in which a colony of bees was placed. Loss of bees from 12 colonies occurred during spraying of a cornfield with selective weedkiller. Rape fields sprayed while in flower with dieldrin against pollen beetle caused the loss of flying bees from four nearby apiaries.

This evidence shows the need for good supporting field evidence if data of value are to be obtained in the framing of recommendations for the avoidance of casualties to bees. Having regard to the great need of bees for pollination, it may be considered that manufacturers of new insecticides, fungicides, etc., should examine the toxicity of their products on useful insects such as bees.

Aromatic Intermediates Up-to-Date, by Dr. Adams

Paper Given at SCI Annual Meeting

THIS SUMMARY is based on a paper given by Dr. D. A. W. Adams, a director of Hickson and Welch Ltd., Castleford, Yorks, on 11 July during the annual meeting of the Society of Chemical Industry. Title of Dr. Adams' paper was 'Industrial organic intermediates: past, present and future' and it had particular reference to the West Riding of Yorkshire which, as he said, 'has long been one of the two main centres of the British dyestuffs and dyestuffs intermediates industries'.

The SCI annual meeting was held in Leeds from 8 to 13 July and was reported in last week's CHEMICAL AGE.

Introducing his paper, Dr. Adams said that he had found that some confinement of the subject was necessary and he had decided to restrict the field essentially to aromatic chemicals.

The term intermediate came into use to designate those compounds which by relatively simple steps could be converted into dyes, and which were produced by subjecting coal raw materials to the general reactions of aromatic organic chemistry.

Today dyestuffs comprise a relatively small percentage—15 to 20 per cent is quoted—of the total intermediates market. They are raw materials for pharmaceuticals, fine chemicals, the rubber industry, plastics and resins, man-made fibres, insecticides, agricultural chemicals, synthetic detergents, and many other specialised industries.

Classical Intermediates

Classical intermediates were derived from benzene, toluene, naphthalene and anthracene, together with xylene, phenols and cresols, carbazole, etc. Benzene is still the most important aromatic hydrocarbon but coal tar sources have been supplemented by petroleum. About 32 per cent of US production is derived from petroleum.

Present production in this country is nearly 100,000 tons a year of refined benzene, of which only 10 to 15 per cent is used for dyestuffs; 20 per cent is used for phenol, 15 to 20 per cent for ethylbenzene (to produce styrene) and 15 per cent for dodecylbenzene for synthetic detergents. Other uses are for monochlorobenzene and benzene hexachloride.

Of the 37,000 tons a year of pure toluene made in the UK only about 15 per cent is used for dyes. Explosives require considerable quantities, and the new polyurethane rubbers will require increasing quantities.

Xylene production in the UK is now 18,000 tons a year. In the US 90 per cent of the total, amounting to 315,000 tons a year, come from platforming operations. All three isomers have become commercially available in recent years because of interest in the derived carboxylic acids—terephthalic acid for Terylene and isophthalic acid for resins and plastics. p-Xylene is the main requirement in the UK, 1956 use being approximately 5,000 tons. Annual requirement in a few years' time is expected to be 10,000 tons.

US prices for the isomers are: ortho-5c a lb., meta-13c and para-19c. The ethylbenzene also found in crude xylene is available at 3c a lb.

Classical aromatic hydrocarbons are being supplemented by new synthetic materials made by condensing benzene with petroleum-derived aliphatic compounds. In the UK 25,000 tons a year of ethylbenzene are being produced from benzene and ethylene for conversion into styrene. A further 15,000 tons is being condensed with propylene-tetramer to give dodecylbenzene for synthetic detergents.

In the US, France, Germany and Canada, benzene is also being condensed with propylene to give isopropyl benzene as a source of synthetic phenol. p-Cymene is being produced in the US from turpentine oil for conversion into p-cresol by a similar process.

Production of naphthalene in the UK has increased by 25 per cent in the last 20 years to 43,000 tons a year, two thirds of which is used for oxidation to phthalic anhydride.

Sulphonation was initially an intermediate stage in the production of dyestuffs but today aromatic sulphonation acids have a large use in their own right, e.g. dodecylbenzene sulphonic acid, the essential active ingredient of nearly all heavy-duty detergents.

Because of the increased uses for phenols in recent years (32,500 tons production in 1954) the classical sources—coal tar products and fusion of sulphonic acids—have been largely replaced by cheaper and more convenient methods.

Most recent method for phenol is the benzene/propylene condensation mentioned previously. The resulting isopropylbenzene is oxidised to the hydroperoxide and split with sulphuric acid to phenol and acetone. Plants are in operation in the US (34,000 tons), France (13,000 tons), Germany and Canada (6,000 tons each). No plant has so far been erected in this country, presumably because there is sufficient capacity by the existing routes.

Costs by this route are said to be only 70 to 80 per cent of costs by earlier processes. If it is exploited in the future it may well cause phenol manufacture to move away from coal centres, to new areas adjacent to petroleum refineries.

The same route is being developed to give other phenolic compounds, e.g. resorcinol from m-diisopropylbenzene. Production of β-naphthol has been investigated although it has probably not yet been exploited commercially.

Tri-substituted Phenols

Tri-substituted phenols are of importance as antioxidants for petrol and foodstuffs. A new plant for the production of 1,600 tons a year of 2:6-ditertiary butyl-p-cresyl is being built in north-east England. In the US, 3,500 tons of this product were produced in 1955. This calls for increased tonnages of p-cresol and coal tar and petroleum sources have been found inadequate in the US where a plant has recently come into operation to produce 1,300 tons a year from p-cymene, a by-product from turpentine oil, again using the hydroperoxide route. Natural sources have not yet been supplemented in this country.

Nitration and reduction were the two earliest large-scale chemical operations carried out, dating from Perkin's mauveine synthesis. Some nitrations are now carried out continuously and the classical iron reduction method is being replaced to some extent by catalytic methods.

Mononitration of toluene produces a mixture of 32 per cent para, 4 per cent meta and 64 per cent ortho isomers. Recently the separation of the pure meta isomer has become routine and much of the meta product is used for reduction to m-toluidine as an intermediate for one of the special developers for colour photography.

Delegates at the SCI annual meeting visiting the school of chemistry, University of Leeds, on 9 July, l. to r., Dr. Ing. F. Krejce (Czechoslovakia), F. Wilkinson (research student), P. C. Crowther (Colonial Office), D. M. Hodgson (University of Leeds), C. S. Bryant (late of Ministry of Supply), C. A. Colman-Porter (head of science department, South Devon Technical College) and Dr. J. W. Belton (senior lecturer in chemistry, University of Leeds). They are in the gas kinetics laboratory where radioactive tracer techniques are being used

L. to r., H. H. Thomas, E. W. B. Dunning (North Thames Gas Board), Mrs. Thomas and J. J. Priestley (W. C. Holmes and Co., vice-chairman, Yorkshire section, SCI)

One of industry's main problems is to keep the demand for ortho and para fractions in line with the quantities produced. Demands for p-nitrotoluene have always been greater than for the ortho product except in war time when the ortho product is used for making TNT and DNT. In peace time, and in the atomic age, there is less demand and price comes very much into the picture.

Recent developments in the dyestuffs and pharmaceutical fields have aggravated the position by increasing demand for the para compound. Developments in progress on polyurethane foam rubbers may adjust this as the ortho compound can be used as a raw material.

The development of these polyurethanes has led to a vast increase in the production of toluylenediamines and in the US the present capacity is stated to be 20,000 tons a year with another 10,000 tons planned.

Conventional oxidising agents such as permanganate, dichromate and hypochlorite have largely been replaced by less expensive methods using nitric acid or air in the presence of catalysts. Two early examples of these processes were the oxidation of naphthalene to phthalic anhydride and of anthracene to anthraquinone. More recent examples are in the field of man-made fibres where cyclohexanol-cyclohexanone mixtures are oxidised with nitric acid to adipic acid for nylon, while p-xylene is oxidised in various ways to terephthalic acid for Terylene. Nitric acid is mainly used in the UK, but in the US two-stage catalytic oxidations, oxidations in the presence of ammonium sulphate, and liquid-phase air oxidation in the presence of bromine and a metal as activators are all in use.

Returning to the dyestuffs field; in the field of azo dyes the tendency has been to obtain increased fastness properties by resource to more and more complicated intermediates. The use of sulphonamide and substituted sulphonamide groups and of sulphone groups is particularly noticeable.

In the azoic field the trifluoromethyl group is used as an electronegative group which is stable to alkalis and which produces fast-to-light shades not otherwise obtainable.

The new Procion range of dyes depends on the presence of reactive chlorine atoms, present in the shape of cyanuric chloride derivatives.

Closely allied to the dyestuffs proper are the optical whitening agents, now widely used in soaps and detergents, in the paper industry and in textile processing. Biggest tonnage products in this field are based on 4:4′-diaminostilbene-2:2′-disulphonic acid.

In conclusion it can be said that there are three main changes which have taken place in the past 15 to 20 years:

(1) A rapid broadening in the field of primary intermediates, so that their use in fine chemicals, pharmaceuticals, plastics, fibres, agricultural chemicals and detergents, now greatly exceeds their use in the dyestuffs field.

(2) A change in source and variety of primaries due to the impact of the petroleum industry.

(3) Increased complexity of intermediates used specially for the dyestuffs and closely related fields.

Murdoch's Work Recalled at SCI Annual Dinner

SPEAKING during the SCI 76th annual dinner in Leeds on 10 July, Colonel Sir Harold Smith, chairman of the Gas Council, said that the man he was most interested in in the field of applied chemistry was William Murdoch, from whose early experiments was developed the gas industry as we knew it today. 'It is fair to say,' he added, 'that William Murdoch was not only the father of gas, but also the father of all the coal tar products with which the manufacture of gas is associated.'

Sir Harold was proposing the toast of the society. Other speakers included Dr. H. K. Cameron, hon. secretary for home affairs, who proposed the toast of the guests and Alderman J. Hiley, Lord Mayor of Leeds, and Brigadier J. N. Tetley, Pro-chancellor, University of Leeds, who responded.

After the dinner the scroll of honorary membership of the society was presented to Professor A. Nasini of Italy. Following this, Mr. H. Greville Smith, president-elect, was introduced to members by the retiring president, Mr. Julian M. Leonard.

New Fluorine Polymer

The new co-polymer of tetrafluoroethylene and perfluoropropylene which was mentioned in the paper given by Mr. G. W. Bowley, plastics division, Imperial Chemical Industries, at the Plastics Convention this week (P.98), is Teflon 100-X. A note on this new perfluorocarbon which is being produced by E. I. du Pont de Nemours Co., US, was published in CHEMICAL AGE last week, p. 70.

SCI Medal Address on 'Our World' by W. J. Worboys

THE SCI Medal, which is awarded not more than once every two years, was presented on 10 July to Mr. W. J. Worboys, commercial director of Imperial Chemical Industries, by Mr. Julian M. Leonard, retiring president.

In his address after the presentation Mr. Worboys said that there had been 30 medallists in the 60 years since the first award. This was a very short period in the history of man, "but what invention and what development has been packed into these few years. Nowadays events crowd on us so fast that we have little opportunity—alas, sometimes little inclination—to stand back and view broadly the happenings of even our own working lives'.

J. Safranek, left, and Dr. Ing. F. Krejce, from Czechoslovakia, with Dr. D. P. Kharbanda, of India, on the right

Mr. Worboys said that he proposed to stand back and take such a view. If his address needed a title it would be 'Our World'.

Sir William Crookes, SCI medallist in 1912, had declared 14 years previously that the world would suffer hunger by the 1930s unless wheat production was increased. Exactly 100 years before this Malthus had stated that population, when unchecked, increased in geometric proportion while food supplies only increased in arithmetric proportion. Population always increased to the limits of the means of subsistence and was prevented from increasing beyond these limits by the positive checks of war, famine and pestilence and by the influence of misery and vice.

There were two reasons why the forebodings of Malthus did not materialise: the industrial revolution and the unforeseen development of agricultural production in North America and other parts of the world.

Crookes had suggested that the solution was to make synthetic nitrogenous fertilisers from the nitrogen in the atmosphere. This suggestion was soon acted on. In 1905 large-scale commercial production of calcium nitrate began in Norway and in the same year the Germans started the manufacture of calcium cyanamide. Haber and Bosch later developed the synthetic ammonia process.

'By 1939 nearly three-quarters of the world production of nitrogen was fixed from the atmosphere and today the proportion is even greater.'

The chemical industries' contribution to medicine was next discussed by Mr. Worboys. First came the discovery in 1899 of the analgesic properties of acetylsalicylic acid. In 1910 Ehrlich established the effectiveness of salvarsan. In the 47 years since the discovery of salvarsan Mr. Worboys said that we had seen the development of many new drugs.

'But' went on Mr. Worboys 'the chemical industry touches the day-to-day life of man at many points other than his food and his aches and pains.' He mentioned man-made fibres, plastics, electroplating, transport, telephone and radio, and nuclear energy.

He then referred to the growth of British industry. 'In 1900' he said, 'British exports of manufactured goods were some £300 million and this represented about one-third of the total world exports of manufactured goods. In 1955 our exports of manufactured goods were approximately £3,000 million but this large figure represented only about one-fifth of the total world exports.'

In conclusion Mr. Worboys said that he had intended to say something about the commercial side of the chemical industry. He said that most of his audience had been brought up on the technical side and were inclined to believe that 'any old fool can sell'.

In his opinion the recruitment and training of commercial staff was just as important as that of technical staff.

RAPID INCREASE IN PETROCHEMICAL OUTPUT FORECAST BY OEEC COMMITTEE

TOTAL capital invested in the petrochemical industry of West Europe since 1945 in terms of plant in operation rose by about 15 per cent to some $372 million by the end of 1956. It is expected to increase even more rapidly to over $980 million by the end of 1959. This is stated in a review of petrochemical production in OEEC member-countries in 1956 and plans for expansion up to the end of 1959 prepared by the petroleum chemicals working party of the chemical products committee of the Organisation for European Economic Co-operation.

The review, copies of which are not yet available in this country, shows that production is also rapidly increasing. The total carbon content of petrochemicals produced in OEEC member-countries rose from about 200,000 metric tons in 1953 to some 400,000 tons in 1955 and 470,000 tons in 1956. In 1957 the total production is expected to rise to nearly 580,000 tons and in 1960 to over 1.2 million tons.

This expansion, the rate of which is steadily increasing, will cover in the main synthetic rubber (both S type and butyl) polythene and ethylene oxide derivatives, solvents and raw materials for plastics and detergents.

Dyestuffs. Meeting under the chairmanship of Mr. F. Brichet (Switzerland), the dyestuffs working party of the OEEC chemical products committee, reviewed production in 1956 and 1957. In 1956 production of dyestuffs in member-countries totalled about 112,000 tons, or 4 per cent less than in 1955. Estimates for 1957 suggest an increase in production of 3 per cent, with the situation generally becoming steadier.

Demand from the textiles industry has improved since the beginning of 1956. Demand from other industries also seems to be growing. Although trade between member-countries rose as compared with 1955, trade with other countries remained at much the same level as in 1955. Prices were still inclined to fall in 1956, but have steadied since 1957 and even show a tendency to rise.

Soap and Detergents. For the 14 European countries which together account for practically the entire output of soap and synthetic detergents of the member-countries, soap production in 1956 at 1,600,000 tons was 4 per cent higher than the year before. In 1956, production of synthetic detergents, at nearly 900,000 tons, was 14 per cent higher than in 1955.

The soap and detergents working party of the OEEC chemical products committee, meeting under the chairmanship of Mr. Dobbelmann (Netherlands), considered that the increase in soap production in 1956, particularly in some of the countries, was due to a temporary increase in demand as a result of the political situation at the end of the year rather than to a reversal of the downward trend apparent for a number of years. It seems likely, therefore that in 1957, soap production may fall particularly sharply in those countries showing an increase in 1956.

The increase in synthetic detergent production may continue, but at a slower pace than in recent years. Prices of soap and synthetic detergents have shown little change in most countries.

Tanning Materials. 1956 production of vegetable tanning materials, amounting to 87,500 tons of pure tannin, was about 5 per cent more than in 1954 and roughly the same as in 1955. The tanning materials working party of the OEEC chemical products committee, expects much the same situation in 1957. Production of synthetic tannins has kept more or less steady.

During the last few years, prices have shown a downward trend owing mainly to competition from imported vegetable tanning materials and this trend was accentuated at the beginning of 1957.

Determining Microamounts of Calcium, Magnesium and Aluminium in Titanium

IF ACCURATE photometric determinations of minute amounts of calcium, magnesium and aluminium normally present in titanium are to be made, these amounts must be separated and without loss. H. Gotô and S. Takeyama have recently reported (*Science Reports* of the Research Institutes, Tôhoku University 1957, Series A9, No. 2, 138) a method whereby most of the titanium was removed by extraction with ether, using hydrochloric acid and in the presence of potassium thiocyanate.

It was shown by experiment that (1) addition of more than 5g. potassium thiocyanate was required for every 0.5g. titanium; (2) concentration of hydrochloric acid should be about 2N and (3) if the volume of solution was kept as small as possible, better extraction was obtained. If sulphuric acid was used to dissolve the sample, a lower rate of extraction was obtained. It was also observed that during ether extraction, calcium, magnesium and aluminium were almost completely retained.

Photometric determinations of the three elements were made by using plasmocorinth B (sodium chloro-phenol-azo-dihydroxy-naphthalene-disulphonate) for calcium, titan yellow for magnesium, and separation with sodium hydroxide and oxine-benzene extraction with its filtrate for aluminium.

In samples taken from metal plate, crude metal and sintered titanium, the method gave satisfactory results for determinations of the three elements.

Slight Rise in Chemical Prices

A SMALL increase in the wholesale price of chemical and allied products during June is shown in the latest Board of Trade index. The June figure (provisional) is given as 142.3, a rise of .3 compared with May and 3.3 up on the June 1956 figure. The figures for individual chemical and allied items are given as follows (30 June 1949 = 100):

	June 1956	May 1957	June 1957
Dyes and dyestuffs	138.0	143.1	143.1
Disinfectants	123.7	126.5	126.5
Insecticides, weedkillers, fungicides	138.3	131.7	131.7
Synthetic resins and plastics materials	122.8	121.1	121.1
General chemicals	156.5	158.4	158.4
Benzole, pure, BS 136/1950	182.9	182.9	182.9
Caustic soda liquor, 100 TW	157.6	157.6	157.6
Soda ash, light, d/d	164.5	164.5	164.5
Soda ash, light, f.o.r., works	173.4	173.4	173.4
Sulphuric acid, BOV	173.7	177.2	177.2
Sulphuric acid, ROV 94/95 per cent	181.8	181.8	181.8
Drugs and pharmaceuticals	105.2	104.2	105.3
Carbon blacks	130.8	135.4	133.4
Fertilisers	198.3	203.7	203.7
Pyrites, c.i.f., UK ports	180.4	173.5	174.6
Sulphur, crude (for acid making), c.i.f.	179.2	185.4	185.4

Funds Sought for Scottish College

The Brewing and Applied Chemistry Departments of the Heriot-Watt College, Edinburgh, is to be brought up to modern standards by a refurnishing programme estimated to cost £150,000. An appeal for funds by the college resulted in donations of £6,000. The balance is now being sought from the industries which will benefit from the development.

★ THE INTERESTING suggestion that the Society of Chemical Industry should consider creating a new general group or section which would give members opportunities for discussing the wider political and economic factors which influence the chemical industry was made by Mr. W. J. Worboys, commercial director of ICI, when he gave the SCI medal address at the annual meeting last week.

Mr. Worboys, who although he has a D.Phil. degree, prefers to be called 'Mr.', added that nothing could be more fertile than the exchange of ideas between people with common interests and responsibilities. In the light of the growing international competition, the need to find solutions is great and urgent.

He felt that the need for more 'profit producing work' to be put in before more profit is taken out either as dividends, wages or taxes, was sufficiently close to the 'practice of applied chemistry' (to quote the SCI charter) to fall within its sphere of activity.

The economic health of the industry is of vital interest to all members of the society and the opportunity of discussing it within a society that by its title is intimately concerned with the chemical industry should prove very worthwhile. Certainly, the suggestion should have the fullest consideration of the SCI officers.

★ THE IMPRESSIVE record of a million man-hours worked without a single lost-time accident has been gained by the Thames-side factory at West Thurrock, Grays, Essex, of Thomas Hedley and Co. Ltd., which produces soaps and detergents.

On Monday, Mr. R. W. Hawkes, Hedley personnel director, congratulated Mr. Stanley O'Gorman, joint chairman of the works council, on behalf of all employees. Mr. Hawkes also presented a new gold star for the green and gold flag flown over the plant. A star is added to the flag for every 500,000 safe man-hours worked. Thurrock is now a two-star factory.

★ Three new ammonia synthesis plants now being built by the Foster Wheeler Corporation of the US will, when complete, give this international organisation a total of nine synthesis plants with a combined daily capacity of 1,585 tons. Among the three now in hand is the largest the company has yet tackled. Alembic learns that it is a 305-tons-a-day plant for Petroleum Chemicals Incorporated. The other two in hand are for the Texas Co. and the Consumers' Farm Chemicals Association, and both have a daily capacity of 180 tons.

The Foster Wheeler processing sequence has six stages: (1) air fractionation into liquid oxygen and gaseous nitrogen, with a portion of the nitrogen stream liquefied for use in stage 5; (2) partial oxidation of hydrocarbon feed gas (or liquid) with oxygen from stage 1 (under pressure and without catalyst) to produce hydrogen and carbon monoxide; (3) shift conversion of carbon monoxide from stage 2 to carbon dioxide and additional hydrogen by catalytic action with steam; (4) carbon dioxide removal, which involves scrubbing the shifted gas, mainly hydrogen and carbon dioxide, with monoethanolamine, followed by caustic scrubbing; (5) liquid nitrogen wash, in which the gas stream from stage 4, mainly hydrogen, is washed with liquid nitrogen to remove trace impurities of carbon monoxide, methane, oxygen, argon, etc.; (6) the ammonia synthesis in which final high-purity mixture of hydrogen and nitrogen, from stages 1 to 5, is compressed to 9,000 to 12,000 p.s.i.g. and catalytically converted to ammonia.

★ ALEMBIC was intrigued to read of some of the problems facing the transport department of Badische Soda und Anilin Fabrik in the second issue, 1957, of *Die BASF*. One of the main tasks of this section is to ensure speedy despatch at favourable freight rates, for with a turnover of 1,200 million DM n 300 working days, a delay of one day in despatch means that working capital of about 4 million DM is tied-up.

The company uses the Rhine as a cheap means of transporting about half of its exports. All the railway traffic, goods and passenger, is served by the station 'Ludwigshafen BASF' and 300 loaded wagons leave here each day. A special factory unit controls about 1,300 tank trucks and acid reservoir trucks for railway transport.

The Rhine trans-shipment plant, largely destroyed by 1945, has been reconstructed almost from scratch and to-day a trans-shipment figure of nearly 2,800,000 tons has been achieved.

BASF have their own customs and excise department, which has the job of applying for exemption from or reduction of duties for imported goods. They also have their own travel office which can issue tickets for rail, ship and air transport, and their own road and rail services.

★ A QUESTION that comes up with unfailing regularity in the field of pharmaceutical chemicals looks like becoming a hardy annual so far as horticultural chemicals are concerned—'What do you mean by a teaspoonful?'. This point has recently been the subject of correspondence in the *Gardener's Chronicle*.

It seems that chemical manufacturers vary much in their recommendations for measuring and mixing insecticides, weedkillers, fertilisers—ranging from the 'one tablespoonful to two gallons' variety, the 'one part in five'. '2 lb. per rod', to the packet which says '5 fl. oz. per gallon'.

In replying to this correspondence, Mr. P. T. MacCormack, of the Murphy Chemical Co. Ltd., Wheathampstead, Herts, puts forward some of the difficulties facing the manufacturer and ends by saying that everything is done to make the measuring and mixing as simple and foolproof as possible.

Of course, it doesn't help matters when the cutlery trade produces a variety of sizes of teaspoons and tablespoons. Matters are further complicated by the fact that powders vary considerably in their density. Before Alembic gets any further into this jungle, he throws out the suggestion that through their association, the manufacturers might get together to devise some standard system for measuring and mixing instructions.

★ WHERE does the money go—5? This week Alembic spotlights the results of Coalite and Chemical Products Ltd., Bolsover, for the year ended 31 March. Receipts from sales, services, etc., totalled £5,191,819. Of that total, 55.3 per cent was spent on coal and other process materials; wages, pensions and national insurance accounted for 17.13 per cent; plant maintenance, including depreciation, 8.45 per cent; cost of selling, including advertising, 4.42 per cent; general running expenses, 1.85 per cent; income and profits tax, 6.35 per cent; dividends, 2.02 per cent; retained to meet demand for increased working capital and new plant, 4.34 per cent.

★ OPENING of the new head office of the United Kingdom Provident Institution at 33 Gracechurch Street, London EC3, on 10 July, was not only a notable City occasion, but its importance was enhanced by the speech of Mr. Peter Thorneycroft, Chancellor of the Exchequer, who, in performing the opening ceremony, issued the first of his new warnings against inflation.

The occasion had a special significance for Alembic in view of the close association between Benn Brothers Ltd., proprietors of CHEMICAL AGE, and the Institution. Sir John Benn, who presided at the ceremony, is a director of Benn Brothers and is chairman of the UK Provident Institution. Among the distinguished guests were Sir Cullum Welch, Lord Mayor of London, and Mr. C. G. Cobbold, Governor of the Bank of England.

This was an occasion of history repeating itself for the ceremony took place exactly 50 years after the Institution's previous head office at 196 Strand was opened by the then Chancellor, the Rt. Hon. H. H. Asquith.

Alembic

BRITISH PLASTICS CONVENTION

Preparing Olefin and Diene Polymers, by Professor Mark

THE FIRST paper to be read at the British Plastics Convention, which began 11 July, dealt with 'Synthesis and properties of olefins and diene polymers'. Authors of the paper were Professor C. G. Overberger and Professor H. Mark of the Polytechnic Institute of Brooklyn. Professor Mark delivered the paper.

The present state of methods to prepare linear polythene, isobactic polypropylene and diene polymers with controlled cis-trans character were reviewed. The situation was likened to the emulsion polymerisation of monomers such as styrene which was the subject of commercial interest but was not fully understood 30 years ago.

Interest regarding the proper choice of counter ion was governed by commercial considerations such as the amount of catalyst to be used, the quantity of polymer produced per pound of catalyst, etc. Work on catalyst at Brooklyn, said Professor Mark, had been on different lines to that of Ziegler. A catalyst of their own devising had given them polymers with a different molecular weight distribution from commercial polymers. The polymers produced had a sharp molecular weight distribution, unlike the technical polymers which were broad mixtures. Their work at Brooklyn had not, however, included any actual molecular weight determinations, but viscosity measurements had given them sufficient information for their purpose.

According to Professor Mark one of the most important factors was that by controlling the supply of monomer the formation of dimeric, trimeric and tetrameric molecules could also be controlled. This phenomenon, which had already been noted in the case of polymers of low molecular weight such as conventional polythenes, was of fundamental importance, it was stated, in the production of polymers having a sharp molecular weight distribution.

Some of the more interesting aspects of isobactic polymerisation were then discussed. Thus, butadiene could replace one double bond, or two double bonds, and a butadiene metal complex with a spare double bond gave an isobactic 1:2 polymer. In the case of the very effective catalyst consisting of titanium tetrachloride and aluminium triethyl the titanium was responsible for collecting the complex while the aluminium 'triggered off' the reaction.

Professor Mark then discussed the compounds which could be combined together to catalyse the polymerisation reaction, ranging from BF_3 to $Ti(OR)Cl_2$ and from $LiHAlH_3$ to $Al(OR^1)R_2$.

In the discussion which followed a member of Petrochemicals Ltd. asked why it was, that by reacting $AlRCl_2$ with $TiCl_4$ and $AlRCl_2$ with $TiCl_3$ only a little polymer was obtained yet when all three constituents were present a big yield of polymer was achieved.

Professor Mark agreed with the questioner that this was the case but he could not give a reason. The problem was well worth investigating and he suggested that it would be useful to vary the proportions of one of the constituents of this mixture and study the effect it had on the amount of polymer produced.

Problems of Low-Pressure Polythenes

SECOND of the papers on olefins was by Dr. Erhard Grams, Farbwerke Hoechst AG., who considered 'Some aspects of low-pressure polythenes'. By concentrating upon low-pressure polythenes Dr. Grams in effect extended Overberger and Mark's paper by dealing with the practical difficulties involved in characterising polymer structure and relating this information to properties and applications.

A satisfactory characterisation of these new polymers was essential. Due to the low solubility, it was somewhat difficult to determine their molecular weight according to the usual osmotic method. The light-scattering method had been found applicable, however. Determination of viscosity presented no difficulty, but Dr. Grams suggested this method was of limited practical value, particularly if molecular weight distribution was not known at the same time. More work, suggested Dr. Grams, should be devoted to a determination of the latter and determination of its influence on the properties. In practical investigations Grader values were helpful.

Mention was made of the spiral injection test of Campbell and Griffiths which was stated to be a useful means of assessing the processability of a polymer, although the relationship between spiral length and melt index was not simple. Results of this test compared satisfactorily with Grader values and with experience in practice. Dr. Grams, however, stressed the necessity for an international standardisation.

Dr. Grams said that for characterisation of polymer structure the determination of the degree of branching by infra-red methods was important. Double bonds could also be determined in the same way. The amount of crystallinity in low-pressure polythenes was easy to measure and of great influence on properties as rigidity, tensile strength, flexural strength, etc.

An important means of predicting the behaviour of polythene was the determination of the stress/strain relationship of the polymer. The thickness of the test bar was relevant: in the case of low-pressure materials it exerted a great influence, although with high-pressure materials it was relatively unimportant. The difference was most pronounced with highly crystalline materials.

In general, said Dr. Grams, test conditions had more influence on results with low-pressure polythenes than with the more conventional polymers. Low-pressure polythenes had quite high tensile strengths and low elongation at low rates or elevated temperatures respectively.

Apart from its physical properties, the ageing behaviour of low-pressure polythene was very important. One positive fact, Dr. Grams remarked, was that oxygen had to be present for ageing to occur. Whereas low-pressure polythene in contact with nitrogen at 120 °C. showed no deterioration after years of test, when oxygen was present embrittlement took place within a matter of weeks.

It was stated by Dr. Grams that all methods of testing for oxidation were inaccurate; it was necessary, therefore, to observe changes in properties, such as density, notched impact strength and so on. While the melt index could be measured the viscosity could not, due to the cross linking which took place.

Regarding stabilisation of low-pressure polythene, Dr. Grams said that this could be carried out in the same way as for high-pressure material, using carbon black or organic stabilisers.

Stress Failure in Polythenes

IN HIS PAPER on 'Stress cracking in polythenes,' Mr. James A. Reid, Phillips Petroleum Company, suggested that long term stress failure of polythenes was neither startling nor unexpected. It did indicate, however, that insufficient attention had been paid to basic engineering design aspects of polythene.

In thermoplastic resins, stress failure occurred in three basic ways: ductile failure at high stresses (or temperatures), 'environmental cracking' at moderate stresses, and brittle fractures at low stresses and long times.

Ductile type failures occurred particularly in lightly branched polythenes, while brittle fracture might result in linear polythenes of relatively low molecular weight. With branched and linear polymers, however, both ductile and brittle failures could occur.

Dramatic improvement in stress cracking resistance was observed with increasing molecular weight and the chain ends of polymers were important as a cause of stress failure. Excellent resistance to stress cracking was noted in linear polythenes of high molecular weight but fabrication had proved difficult.

Long-term rupture was associated with creep but this could be prevented, the lecturer stated, by stabilising the polymer against creep, employing high pigment loadings, cross-linking by irradiation and chemical cross-linking. It was suggested that additives which affected the crystallite and spherulite growth habits of polythene would be particularly beneficial.

MR. BOWLEY DESCRIBES RECENT FLUORINE POLYMER ADVANCES

WORLD consumption of fluorine polymers is approaching 2,000 tons a year of which over 90 per cent is polytetrafluoroethylene (p.t.f.e.). This was stated by Mr. G. W. Bowley, plastics division, Imperial Chemical Industries Ltd., in his paper on 'Recent advances in fluorine polymers' in the section devoted to material developments in plastics.

Included in the fluorine polymer range, headed by p.t.f.e., are polychlorotrifluoroethylene, elastomeric co-polymers of vinylidene fluoride with both chlorotrifluoroethylene and perfluoropropylene. Mr. Bowley also mentioned a co-polymer of tetrafluoroethylene and perfluoropropylene which is stated to have properties approaching those of p.t.f.e., but capable of being processed by conventional thermoplastic polymer techniques. A clear picture of its limitations was not possible as insufficient was known about this co-polymer.

Mr. Bowley classified the fluorine polymers as development products and, he said, due mainly to thermal degradation at processing temperatures, their early promise of wide application as high-temperature, chemically resistant polymers capable of being handled by conventional means had not yet been fulfilled.

Research was now being directed to removing the limitation of poor low temperature characteristics of fluorocarbon elastomers which were superior to silicone rubbers in both mechanical strength and chemical resistance at elevated temperatures.

The granular form of p.t.f.e. still remained the most important form of the polymer, although the author of this paper suggested that within the next two or three years the more recent dispersion polymer form was likely to assume the leading role. Aqueous dispersions, it was stated, were gaining in importance particularly for film casting, impregnation of yarn, fabrics and porous metals, and for mixing with fillers to produce moulding powders of special importance to the use of p.t.f.e. as a bearing material. The importance of dispersions as spray coating materials had not reached earlier expectations, due to the difficulty of obtaining pinhole-free coatings, and poor abrasion resistance.

It was now possible, it was reported, to render the surface of p.t.f.e. cementable by treating one surface of tape or sheet, and cementing with epoxide adhesive to metal and other substrates.

According to the lecturer, the future for p.t.f.e. appeared bright, but until some of the fundamental limitations of the other fluorine polymers had been overcome, their future was less certain.

Advances in Gelatin and Glue Research Reviewed at Cambridge

A CONFERENCE on 'Recent advances in gelatin and glue research', held at Cambridge University from 1 to 5 July, was sponsored by the British Gelatine and Glue Research Association. Delegates were accommodated in King's College and the sessions were held in the physical chemistry lecture theatre, through the courtesy of Professor R. G. W. Norrish, F.R.S.

All the senior staff of the association attended as well as 130 visitors drawn from the gelatine and glue industry, user industries and from academic institutions. The conference lecture, on 'Polypeptide chains in proteins', was given by Professor Linus Pauling.

Visitors were welcomed by Mr. S. G. Hudson, chairman of the research association, and the conference was opened by Professor F. J. W. Roughton, F.R.S., one of the visitors to the association appointed by the Department of Scientific and Industrial Research.

Professor Pauling then gave a detailed review of the development theories of the configuration of polypeptide chains in proteins.

By 1947, he said, the planar configuration of the peptide link was firmly established and, adding to this the requirement that back-bone to back-bone hydrogen bonds (N–H . . . C = O) should be linear, Corey and Pauling put forward in 1951 and 1954 a triple coil structure for collagen and a single chain coiled coil structure. Both of these permitted the formation of the maximum number of hydrogen bonds, but they had to be abandoned because they were incompatible with determinations coming forward of the amino acid sequence in collagen, and because they did not fit either the X-ray diffraction patterns observed, or the repeat distances so determined.

Prof. Pauling then discussed the support given by precise molecular models to recent structures for collagen put forward by Crick and Rich, Ramachandran, and Cowan.

In proposing a vote of thanks to Prof. Pauling, Mr. I. H. Chayen emphasised the need of the gelatine and glue industry for fundamental research in the protein field, and stressed the interdependence of technology and fundamental science. The vote of thanks was seconded by Dr. G. R. Tristram.

Thirty-eight papers were read at the conference, which was organised in five sessions.

In the first session great interest was shown in the triple spiral structures for collagen which have been put forward lately by several groups of X-ray workers. Later in the session attention moved to the mechanism by which collagen fibres are laid down, leading directly to the subject matter of the second session, on soluble collagens, etc. Although the chemistry of precollagens was perhaps the major topic here, some valuable studies in the physical chemistry of gelatin were also presented.

The more practical matters in the third session attracted extended discussion, while the significance of arginine residues was one of many topics considered in detail in the group of papers on the 'Chemical and Physical properties of gelatine and glue'.

At the conference dinner, the toast to the Guests was proposed by Mr. H. J. Cotes, managing director and deputy chairman, British Glues and Chemicals Ltd., and replies were made by Dr. H. W. Melville, F.R.S., secretary to the DSIR, Dr. D. Tourtellotte, Chas. B. Knox Gelatine Co. Inc., and Professor Pauling.

Professor Gustavson proposed 'The Association', and Mr. G. W. Odey, president, and Mr. A. G. Ward replied.

The proceedings of the conference are to be published in book form by Pergamon Press Ltd., on behalf of the association. These will be edited by Dr. G. Stainsby, conference secretary.

Permeability of Polythenes, by Professor Stannett

GAS and vapour permeability studies on a series of polythenes of different densities were presented by Professor V. T. Stannett, State University of New York, in his paper 'The permeability of high-density polythenes' during the session devoted to polythenes. Samples examined ranged in density from 0.915 to 0.960 and were prepared by the high pressure method and by the Ziegler and Phillips processes. Gases used in the studies included oxygen, nitrogen and carbon dioxide and the vapours included water and a number of organic vapours.

The effect of crystallinity on changes in gas permeation rates was interpreted by the author according to current theory. Effect of temperature on the permeability constant was also discussed.

Solubility isotherms of various organic vapours was considered in the light of polymer solution theory. Emphasis was laid on the dual role of the polythene crystallites as cross-linking agents and impermeable filters.

Proposals on Rating of Scientific Societies

PROPOSALS regarding the rating of scientific societies and research associations were put before the Minister of Housing and Local Government on Tuesday by a deputation from the Parliamentary and Scientific Committee. Hitherto, industrial research associations have been unable to benefit under the Scientific Societies Act 1843 or under the industrial derating scheme.

The committee wished to inform the minister of its views before the draft Local Government Bill, promised for next session, was completed.

AUSTRALIA'S UNIQUE SULPHURIC ACID PLANT

300 Tons of 100% Acid a Day

LARGEST single-unit plant of its kind in the world, built as one plant without additions, is the £3 million semi-automatic sulphuric acid unit, which began operations at North Birkenhead, South Australia, in August 1955, and which is now producing 100,000 tons of sulphuric acid a year from indigenous pyrites. Production capacity is 300 tons of 100 per cent sulphuric acid a day.

Situated near Port Adelaide River on a 40-acre site, it was completed in two and a half years. The project was undertaken with support of the Federal and State Governments so that South Australia would be assured of supplies of sulphuric acid for the manufacture of essential phosphates. South Australia also wanted to have a self-supporting industry independent of imported raw materials in times of national emergency.

Known as Sulphuric Acid Ltd., the company is owned by three South Australian Companies—Cresco Fertilizers Ltd., The Adelaide Chemical and Fertilizer Co. Ltd., and Wallaroo-Mount Lyell Fertilizers Ltd. Its plant is conveniently sited near proposed wharfs, and to superphosphate works of the shareholding companies.

Simon Carves (Australia) Pty. Ltd., built the plant. Construction work was carried out by J. R. Pillars Pty. Ltd., members of the Simon Engineering Group. The site leaves room for duplication of the plant to enable future demands for superphosphate to be met, or acid to be supplied for any type of chemical industry which may be established in South Australia.

Local Materials

A plentiful supply of local raw material is available as the plant is closely integrated with the mining of pyrites at Nairne, some 30 miles from Adelaide. Pyrites concentrate, assaying 40 per cent sulphur and 10 per cent moisture, is received at the plant by rail at a rate of 1,600 tons a week. It is dried in two balanced draught Rotary Louvre dryers by means of air at a temperature of 200°C.

After leaving the dryers the concentrate is elevated to the feed bunkers from which it is extracted by screw feeders and injected by preheated primary air into three Nichols-Freeman type flash roasters. The roasting chamber is a fire-brick lined vertical cylindrical steel shell, 28 ft. in diameter and 46 ft. high, with conical bottom and domed top. Radiation of heat is prevented by an aluminium sheeted insulating jacket surrounding the roaster. Temperature control of the roaster is effected by a recirculation through the roasters of a proportion of the combustion gases after they have been cooled in the waste-heat boilers.

Both the sulphur and the iron content of the pyrites are burnt in the roasters in an uprising flow of secondary air. The coarser particles of iron oxide cinder fall to the bottom of the roaster and are continuously removed by a screw conveyor. The sulphur dioxide gases and the fine iron oxide dust pass over into waste-heat boilers incorporating Foster-Wheeler type elements to generate steam at 350 lb.p.s.i.

After leaving the boilers, which, in addition to generating steam, serve also to separate a large amount of iron oxide dust, the sulphur dioxide gases are moved by booster fans through the stages of the process which provide for cleaning by cyclonic and electrostatic dust precipitation, scrubbing and cooling by weak sulphuric acid circulations, and acid fog removal by electrostatic mist precipitation.

Three electrostatic dust precipitator units, operating at a potential of 60,000 volts, are provided. In all, 70 tons of iron oxide residue are produced for each 100 tons of pyrites fed to the roaster. This residue is damped by mixing with water in a pug mill and removed by motor truck.

Two void scrubbing and humidifying towers, 30ft. high and 11 ft. 6in. in diameter, constructed of lead and lined with acid-resistant brick, remove the last traces of dust as sludge. The gas is washed and humidified in these towers by a spray of 35 per cent sulphuric acid. Two similar towers packed with Raschig rings are irrigated with 10 per cent acid to effect the final washing and cooling of the gas. The acid in both these circulations is cooled by sea water circulating at the rate of 100,000 galls. an hour through lead coils contained in 24 lead tanks.

Some sulphur trioxide is formed in the roaster through the catalytic action of the iron oxide cinder. This sulphur trioxide is converted to acid in the weak acid scrubbing section of the plant where it is bled off at a concentration of 35 per cent. The amount of acid produced here is 3.5 per cent of the total production and, being highly corrosive and bearing a content of sludge, it is separately transported in a special road tanker.

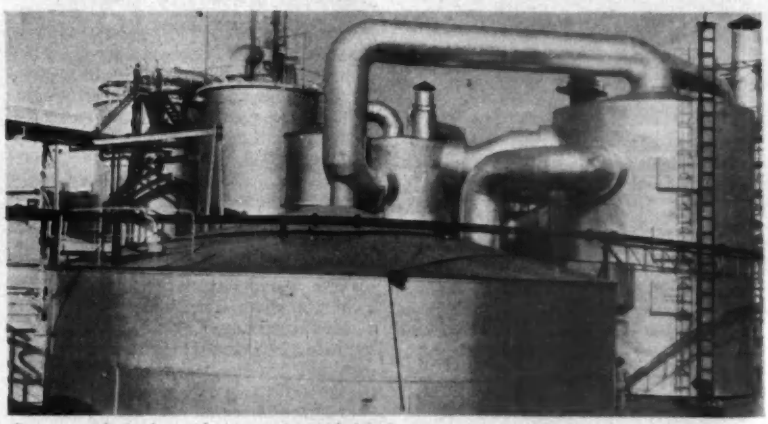
The final purification of the sulphur dioxide is carried out in six electrostatic mist precipitators which remove the acid droplets passing the scrubbing towers.

To the gas (consisting of sulphur dioxide, nitrogen and some oxygen), now thoroughly cleaned and cooled, air is added to reduce the gas tenor to 7 per cent sulphur dioxide. This mixture is next passed to the ring-packed drying tower which is irrigated with 94 per cent sulphuric acid circulated at the rate of 300 tons an hour. The acid, which has a high affinity for water, completely dries the gas. From the drying tower the SO_2-air mixture is moved by the blower at a rate of 2 million cubic feet an hour through the heat exchangers to the converter.

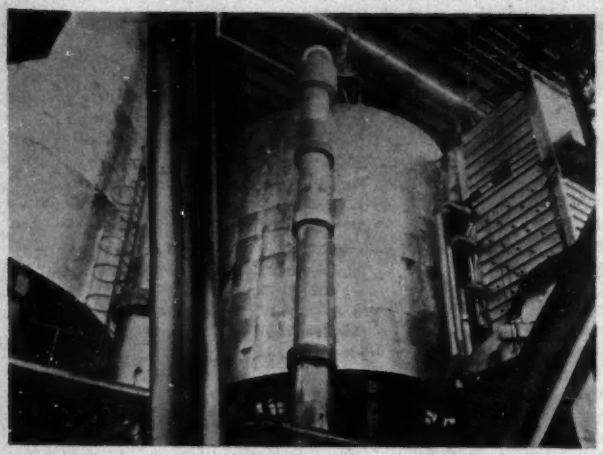
The converter, of the four pass type, contains 54,000 l. of Monsanto vanadium pentoxide catalyst. In this vessel sulphur dioxide combines with oxygen to form sulphur trioxide with the emission of considerable heat, the reaction proceeding rapidly at 400–600°C. in the presence of the catalyst. Control and distribution of temperature over the catalyst mass is effected by leading the gases out from the converter between the passes to the heat exchangers, wherein the incoming SO_2-air mixture is raised to the optimum ignition temperature (420°C.). Final cooling of the product gas from the converter (now consisting mainly of sulphur trioxide and nitrogen) is effected in shell and tube coolers using forced air circulation.

Final Acid Process

Last stage of the acid process is carried out in a ring-packed absorber tower wherein the sulphur trioxide from the converter is absorbed in circulating 98 per cent sulphuric acid. The water in the circulating acid combines with the sulphur trioxide to yield the product acid. The residual gas, mainly nitrogen, is exhausted through the stack to atmosphere. The considerable amount of heat generated in both the drying and absorber towers due to the addition of water is dissipated in the strong acid cooler units composed of three miles of pipes cooled by sea water. The product acid is stored in mild steel tanks having a combined capacity of 2,800 tons, and from these the acid is pumped daily to 34-ton railway tank cars for delivery to superphosphate manufacturers.



Storage tanks in the oxidation section and absorber tower (rear) of the £3 million semi-automatic sulphuric acid plant



Nichols-Freeman flash roasters with waste heat boilers at Sulphuric Acid Ltd., Adelaide

A high degree of instrumentation has been adopted with all instruments grouped in enclosed control rooms to maintain close control over temperatures, gas tenor and pressures, air, gas, and liquid flow rates.

Heat from the exothermic reactions which take place is made use of wherever possible. The steam generated in the waste heat boilers (11,000 lb. an hour) is used to drive a 2,000 kW. turbo-alternator which generates the total electric power requirement of the plant (1,200 kW.) together with a surplus which is exported to the Electricity Trust of South Australia.

In Parliament

MORE MONEY FOR WOOL TEXTILE RESEARCH

THE House last week approved the draft Wool Textile Industry (Scientific Research Levy) Order which increases the yield of the research levy from about £155,000 to about £200,000. The order was introduced by Mr. F. J. Erroll, Parliamentary Secretary to the Board of Trade. It also makes minor alterations in the range of persons liable to pay the levy 'so as to bring it more into accord with the present conditions and current developments in the order'.

The money is needed to provide for additional capital expenditure by the Wool Industry Research Association and to meet higher costs. The Wool Textile Research Council also wishes to increase its grants to other organisations carrying out research.

Mr. Erroll said that wool textile research was supported by the great majority of firms in the industry. A small number of firms and organisations had, however, objected to the increase.

No Decision Yet on Rutile Developments

The Governments of the UK and Sierra Leone have not yet reached any decisions as a result of their discussions with Columbia-Southern Chemicals Co. and British Titan Products Ltd. on the development of Sierra Leone's rutile deposits. This was stated by Mr. John Profumo, Under-Secretary of State for the Colonies, in the House last week.

He was also asked to take into consideration 'the fact that despite the name "British Titan Products Ltd.", this is really an international firm and part of an international restrictive cartel'. Assurances were sought that if the company received permission to develop, it would 'really develop and not restrict development in order to prevent some other company exploiting these important deposits'.

Mr. Profumo said that negotiations broke down because the Government did not feel they could grant various things which the company wanted. He added 'I think that we had better wait until negotiations open again before we go into the matter any further.'

No Price Control for Sulphate of Ammonia

It was stated in the House on Monday that the President of the Board of Trade had no powers to control the price of sulphate of ammonia and that he did not propose to seek such powers.

Sheffield University Receives £25,000 Grant from I.C.I.

A GRANT of £25,000 has been given by Imperial Chemical Industries Ltd., to Sheffield University to assist with the cost of building extensions to the departments of chemistry, fuel technology and chemical engineering.

Plans have been drawn up for an addition of an east wing, housing teaching laboratories, and a west wing for research and staff rooms. The chemistry block was opened in 1954 and was the first erected under a university development plan. The increasing number of students has already overtaken capacity. In the 1956–57 session, 550 students were registered for the department of chemistry which is the largest in the university.

Considerable extensions are planned to the department of fuel technology and chemical engineering.

Armour Research Foundation's Cheaper Titanium Process

BASED on a quantitative separation method for titanium, dating back to 1901, F. Schossberger, of the Armour Research Foundation, has reported a new process to produce pure titanium tetrachloride from low grade ores. In the quantitative method $TiCl_4$ is dissolved in hydrochloric acid, potassium chloride is then added and potassium chlorotitanate (K_2TiCl_6) precipitates.

In the process developed by Schossberger ilmenite is dissolved in sulphuric acid. The iron content is reduced by two crystallisation steps. The sulphuric acid solution is treated with gaseous hydrochloric acid at 0°C. and the mixture is saturated with potassium chloride. Chlorotitanate precipitates out on further cooling, and after separation is heated to 330° to 400°C. Pure titanium tetrachloride is evolved while iron remains with the potassium chloride.

Advantages of the process (which Armour are still developing) are: a cheaper source material can be used, e.g. ilmenite as against rutile; lower process temperatures—400°C. compared with 850°C. required at present; and the titanium tetrachloride which results is pure.

Standard Humidities for Laboratory Work

FIRST MEETING of a new International Standards Organisation committee concerned with atmospheric conditions for testing was held in Paris recently. Known as ISO/ATCO, its aim is to lay down standard temperatures and humidities under which test work should be carried out in laboratories in any part of the world.

After much discussion, delegates agreed on the following three sets of conditions to meet the existing situation in different areas: (1) 20°C. and 65 per cent relative humidity; (2) 23°C. and 50 per cent relative humidity; and (3) 27°C. and 65 per cent relative humidity.

A French proposal that 20°C. and 65 per cent relative humidity should be indicated as the primary temperature was met by including a statement that when conversion factors based on reliable data are developed, then the reference temperature should be 20°C.

It was agreed that tolerances of ± 2°C., ± 5 per cent relative humidity should normally be specified and that when tighter tolerances are necessary these should be ± 1°C. ± 2 per cent relative humidity.

CRL Open Days

Open days of the Chemical Research Laboratory of the Department of Scientific and Industrial Research at Teddington, Middlesex, will be held from Tuesday, 1 October, to Thursday, 3 October. Applications from firms not on the mailing list for invitations to the sessions should be sent to the director not later than 31 August. The sessions are: 1 October, 2.30 to 5.30 p.m.; 2 and 3 October, 10 a.m. to 1 p.m. and 2.30 to 5.30 p.m.

AUTOMATION IN ANALYSIS

Need for Thorough Acquaintance with Instrumental Analysis

CLASSICAL chemical analysis was an art which required only skill, care and patience on the part of its practitioners. The sole instrument necessary was a precision balance. Then, provided that the usual array of titrimetric glassware, etc., was available, any conscientious person could become a reliable analyst.

In recent years, however, greater speed and accuracy has been demanded of the analyst. Furthermore, smaller samples of material need to be handled than previously. This has necessitated a fundamental change in the approach to chemical analysis. The classical gravimetric and titrimetric methods are being increasingly replaced or supplemented by instrumental techniques based on electrical measurements or those involving interaction with radiant energy. These techniques generally avoid the need for chemical separations, and only by such means is it possible to cope with the considerable numbers of analyses required today.

Instrumental methods are, in general, less accurate than the best classical procedures for concentrations greater than one per cent. For determining low percentages, however, they are the more accurate since the measurements usually involve a constant relative error rather than an absolute one.

Disadvantages

Although the amount of analytical information required, and the cost and speed of obtaining it, are all factors which tend to favour the application of instrumental techniques, there are some disadvantages. Thus, the potential variety of uses of such techniques varies inversely with the degree of instrumentation, lengthy and expensive development work is frequently necessary, in setting them up, and maintenance problems vary directly with the amount of gadgetry involved.

It is a common fallacy that, in instrumental analysis, a button is merely pushed and the machine does the rest. Technicians may in fact run routine analyses instrumentally, but difficulties can be encountered with instruments. In nearly all cases they require the presence of highly-trained personnel, both for successful operation and interpretation of results.

The determination of the composition of a substance is fundamentally a chemical problem, whether classical or instrumental techniques are employed. Thus, although the analyst may be able to relegate his problems to the instrument and electronics specialist to a certain degree, he alone can decide exactly what is required.

This article has been specially contributed by Dr. M. Williams, Ph.D. A.R.I.C.

A position is being reached where no analyst can practise his profession efficiently without a thorough acquaintance with the various branches of instrumental analysis. Apart from the customary qualitative and quantitative determinations, the problems of shape and structure on molecular and grosser levels have been added to the province of analysis. The adoption and extension of instrumental techniques therefore strengthens the position and power of the qualified analytical chemist. His numbers will probably increase in the analytical laboratories of the future, and there will be a corresponding reduction in the numbers of skilled classical analysts.

While formerly the emphasis was on prototype design, more recently the tendency has been towards an increasing application of known techniques in the field of instrumental analysis. There are now signs of extensive commercialisation, and even competition, in addition to much published research based on significant experience. No visitor to the recent Physical Society Exhibition (see CHEMICAL AGE, 23 March, page 501) and Instruments, Electronics and Automation Exhibition (see CHEMICAL AGE, 4 May, page 757) could but fail to have been impressed by the wide variety of instrumental equipment now commercially available.

Instrument manufacturers are continually striving to eliminate completely the human element, the most expensive and also the weakest link in the chain of analysis. In this way the field of automatic analysis is gradually being opened up. Complete analyses are rarely 'automised' as such yet, but many of the essential operations have been. Two types of instruments are being used for automatic measurements, based either on an adaption of a classical method previously performed manually or on the application of new techniques relating measurements, readily automised, to information desired.

The subject of automation in analysis is arousing wide current interest, as seen from the fact that the congress on 'modern analytical chemistry' organised by the Society for Analytical Chemistry at the University of St. Andrews recently was fully subscribed at an early date (see CHEMICAL AGE, 27 June, page 1015).

Having given some brief consideration to the position of instrumental methods in chemical analysis, a few of the more important and better established of these methods will now be outlined.

Firstly, it should be mentioned that today there is an increased concern whether or not the material being analysed is a truly representative sample of the main product, and numerous publications have dealt with sample-taking and measuring devices. There is also a growing recognition of the need for automatically conditioning the sample—bringing it to a predetermined temperature or adjustment of the pH—for subsequent operations.

Although separations are avoided whenever possible in analysis, they are frequently essential for removing either the desired constituent or one or more interfering constituents. Separation procedures which have been automised include distillation, electrodeposition, liquid-liquid extraction, chromatography and ionophoresis.

Automatic analytical weighing

A much wider use is currently being made of automatic analytical weighing, ultra-rapid balances are commercially available covering comprehensively, and with extreme sensitivity, all weight ranges down to the micro scale. They are ideal for control work in a wide range of industries. In addition there is the thermobalance, with which it is possible to reproduce and record automatically weight changes, time and temperature for periods up to several days.

The desirable features of automatic titrimetry have resulted in continued activity in this field. Microburette techniques, including recording equipment and synchronised motor-driven systems, have replaced the conventional burettes in many cases. Some progress has been made towards solving the problem of automatically changing the sample. The two most important requirements for all automatic titration methods are the need for a rapid reaction and a constant delivery rate of reagent. It would appear that most titrations can be performed automatically with a minimum of pretitration conditions by using second or third derivative control units in conjunction with potentiometric and spectrophotometric end point detection systems. Other end point detection devices can also be employed in specific cases.

The modern photoelectric spectro-

photometer has provided one of the most direct and serious rivals of the older methods of analysis. Few, if any, physical constants can compare with the light absorption coefficient in regard to selectivity and sensitivity. In the analysis of metals particularly, absorption spectroscopy has resulted in a considerable saving of time and in many cases an increase in accuracy. There are now a number of manufacturers of automatically recording instruments for use in the ultraviolet and visible light regions of the spectrum, while a variety of flow colorimeters, nephelometers, turbidimeters, etc., are also available commercially. Emphasis is being laid on attachments for use with existing instruments. A special flame source has been devised for converting one type of visible light-ultraviolet spectrophotometer into a highly sensitive flame spectrophotometer, and further attachments can be obtained for measuring diffuse reflection and fluorescence.

Infra-red Absorptiometry

The widest advances in any field of analysis in recent years have been made in infra-red absorptiometry, and these are enabling infra-red determinations to become part of the routine service of the analytical chemist. Recording instruments show directly the spectra of substances under test. A higher accuracy is definitely possible with this new technique, in addition to increased speed of analysis. Besides its value in structural analysis, especially for organic materials, infra-red spectroscopy is of tremendous value for the quantitative analysis of complex mixtures which are impossible to analyse accurately by other methods. The continuous monitoring of gas streams is becoming an increasingly important industrial application of the infra-red technique.

Optical emission spectroscopy has been recognised as a high-speed routine control method for 20 years, and the advent of direct-reading techniques in the past 10 years has afforded an additional time saving. X-Ray fluorescence, though still in its infancy as yet, promises to be even more advantageous for routine control. A sizeable capital investment is required in both cases, and certain limitations on sensitivity and accuracy must be recognised. However, with the latest direct-reading instruments, capable of determining 20 to 30 elements per sample, analysis can proceed at a rate of over 1,000 determinations per hour. Therefore, as long-term projects, such instruments are quite economical for steelworks analysis, etc. Two types of instrument are in use, the parallel type which simultaneously determines several elements and the sequential type which analyses for one element at a time in a programmed sequence. The nature of optical emission spectroscopy precludes its use as a continuous analytical system, but the X-ray method should be easily adaptable to meet this requirement.

The chief advantage of polarography lies in its quickness. Thus, it has found wide favour in metallurgical analysis, where one may carry out the determination of several components in a sample in ½-1 hour, including preparation of the sample, with an accuracy of 1 per cent of the absolute amount of each component. In such cases, classical chemical analysis would often last several days. Over 20 years ago polarography, with the automatic recording of polarograms on photographic paper, represented the nearest approach to automation in analysis. The tendency in recent years has been to replace the photographic technique by pen-recording instruments, in which the polarograms can be examined at all stages of development. At the present time the growth of the method in the organic field is even more spectacular than were the earlier applications in inorganic analysis, and it is also being successfully applied to the determination of such gases as oxygen. The general range of application is such that polarography is ideal for semi-micro, micro and trace element analysis, the accuracy and reproducibility often being superior to those of other methods. The technique has already been adapted for continuous-service analysis in the control of components in some industrial processes. Modern developments, including oscillographic and derivative and differential polarography, ensure that the potentialities of polarographic analysis have by no means yet been exhausted.

The principles of mass spectrometry have been known for 40 years, but only within the past 20 years has the method been much applied to the analysis of gaseous and volatile mixtures. In place of a photographic plate, present-day instruments have sensitive electrometers to measure the positive ion currents for each particular mass, and these are automatically recorded as peaks on strip charts. The speed with which analyses can be performed makes the method most suitable for plant control and plant monitoring, and especially so in cases where hydrocarbon analysis is required.

Space alone prevents much further discussion of the subject of automation in analysis. Among other methods, largely or wholly instrumental in character, may be mentioned Raman and microwave spectroscopy, nuclear magnetic resonance, X-ray and electron diffraction, gas phase chromatography, nuclear-radiation measurements, and coulometric, amperometric and high-frequency titration. Many of these methods are already, at least, semi-automatic in operation, and it seems that they will eventually play an even more important part in the transition to completely automatic analysis.

Last, but not least, one of the consequences of adopting instrumental methods of analysis is that information may accumulate at such a rate that it takes more time to interpret than obtain it. The computation of data and its rapid assimilation are therefore an intimate part of the whole problem of automatic analysis.

In conclusion it may be said that although the gap between the available sources of analytical instrumentation and the use made of them is gradually being narrowed there is still a long way to go before it is closed. The importance of the approach to the automatic plant through the application of automatic analysers is fully realised and some notable successes have already been achieved in this field. More can be expected in the near future, a future which offers much of interest to the analytical chemist.

PLASTICS EXHIBITION REVIEW

(Continued from CA, 13 July, p. 69)

Superpolyamide Products

The plastics department of *Algemene Kunstzijde Unie N. V.*, Arnhem, Holland, displayed Akulon nylon, a superpolyamide, which is available in a wide variety of granules for injection moulding and extrusion, as well as in rods, up to 6 in. in diameter. End products exhibited illustrated the versatility of Akulon grades. There are special grades for fast-cycle injection moulding, bottle blowing, foil, tubing, etc.

Polystyrene Products

Expanded polystyrene slab, high impact polystyrene sheet, wall coverings and disposable containers of various types, styrene acrylonitrile copolymer and other miscellaneous mouldings are featured by *Styrene Products Ltd.*, 96 Piccadilly, London W1.

Polystyrene expanded slab demonstrates the interesting possibilities of this material in the fields of cold insulation, display packaging and flotation applications. It is a very light material with excellent thermal insulation properties.

High impact polystyrene sheet appears to be particularly suitable for the vacuum forming process used for the production of packaging containers, etc., while the styrene acrylonitrile copolymer is of interest in that it has resistance to petrol and oils and also to the staining effects of tea and coffee.

Metallised Cellulose Acetate

Transparent, plain, embossed, coloured and metallised cellulose acetate sheeting was exhibited by *Utilex Ltd.*, Mill Street, Kingston-on-Thames, Surrey. Utilex cellulose acetate is available in all colours to specified requirements in thicknesses of 0.0015 to 0.020 in. The metallised material is available on reels and with a pressure-sensitive adhesive backing or a gummed paper backing.

Moulding Powders

Tenite butyrate and polythene moulding powders were the principal exhibits by *Kodak Ltd.*, 1 to 4 Beech Street, London EC1. Other exhibits were Eastman cellulose esters, 'Epolene' polythene wax, low molecular weight polythene in emulsifiable or non-emulsifiable forms, Kodapak cellulose ester sheet—stable transparent sheet, and Eastman industrial chemicals.

India's Nuclear Plans Include Radioactive Laboratory

To be built at Trombay

THE Department of Atomic Energy, Government of India, is rapidly going ahead with plans to produce all the materials required for a large-scale atomic power development programme. It is proposed to construct at least one atomic power station during the Second Plan period, i.e. by 1960–61. One of the by-products of this plant will be concentrated fissionable material, plutonium, required for the more advanced power stations contemplated during the Third Five-Year Plan.

While the swimming pool reactor 'Apsara', the first reactor to go into operation in Asia outside the Soviet Union, was opened in January this year, the NRX reactor presented by Canada is being built at Trombay. The total cost of the project is estimated at Rs7 crores, of which all the external cost amounting to over half the total amount is being borne by Canada. This reactor, which will be completed by the end of 1958, will have a heat output of 40,000 kW.

Important radioactive isotopes, such as radio cobalt which cannot be produced in 'Apsara', and which are used in agriculture, industry and medicine, will be produced in this reactor. A number of Indian scientists and design engineers are undergoing training in Canada in the operation and maintenance of this reactor.

'Zerlina' Reactor

In order to utilise India's reserves of thorium, it has been decided to construct another reactor, 'Zerlina', at Trombay at a total cost of Rs40 lakhs. This is an essential project for work leading to new designs of atomic reactors, particularly those using mixed lattices of uranium or plutonium and thorium.

A radiochemistry laboratory to carry out work on the actinide elements such as uranium, neptunium, plutonium and amoricium and other products of uranium fission, is being set up at Trombay, to provide adequate facilities for handling highly radioactive and toxic materials. The services of Mr. G. R. Hall, of the British Atomic Energy Authority, have been obtained under the Colombo Plan by the Indian Atomic Energy Department and work under his direction will commence shortly.

The capacity of the Alwaye plant for treating monazite sands of South India is being doubled to ensure steady supply of thorium oxide. At present the factory has a capacity to process 1,500 tons of monazite annually producing 1,000 tons of chlorides and 450 tons of carbonates of rare earths, besides 1,500–1,800 tons of crystalline trisodium phosphate and 900,000 gall. caustic soda lye (10–12 per cent) as by-products.

The thorium-uranium plant at Trombay is now meeting the requirements of the gas mantle industry in respect of thorium nitrate.

New Uranium Deposits. The large deposit of uranium and thorium ore discovered in the Ranchi plateau in Bihar appears to be at least 50 per cent larger than that found on the Travancore coast, considered one of the richest in the world. The Ranchi deposits are preliminarily estimated at 3.3 million tons of ore containing 300,000 tons of thorium oxide and 10,000 tons of uranium oxide. The deposit also contains 50 to 80 million tons of ilmenite.

Beryllium. India is one of the world's largest producers of this rare mineral. Preliminary studies made at Trombay show that beryllium oxide would be a very suitable moderator for small power stations with an output of 5,000—30,000 kW. of electricity, a range in which the graphite moderated reactor would be uneconomical.

Know-how for producing atomically pure beryllium oxide and sintering into bricks suitable for use in an atomic reactor has been developed under a project jointly initiated with Commissariat à l'Energie Atomique of France.

Caltex Refinery. India's third oil refinery set up at Visakhapatnam by the Caltex Oil Refining (India) Ltd. at a cost of Rs15 crores went on stream during April 1957. The refinery has a two-stage crude distillation unit, a fluid catalytic unit with gas recovery facilities; polymer plant, propane decarbonisation unit and treating and blending plants.

New Calcium Carbonate Plant. A plant to manufacture 10 tons of precipitated calcium carbonate a day went into production at Habra (Calcutta) during May. The plant, first of its type in the country, has been set up by Radha Chemicals Co. Ltd. at a cost of Rs9 lakhs. The capacity of the plant when fully developed will be raised to 100 tons a day.

Large quantities of calcium carbonate are being imported into India for leather, rubber, pharmaceutical and paper industries mainly from Japan, Belgium and UK. The plant when fully developed will effect a net saving of Rs2.30 crores worth of foreign exchange annually.

Steam Economy. A new system of distillation of absolute alcohol from fermented liquids which reduces steam consumption by 10 lb./gall. of absolute alcohol has been suggested by Mr. S. L. Venkiteswaran of the Development Wing of the Ministry of Commerce and Industry. In this system the heat content of the reflux vapours of the rectifying section is used to operate the dehydration column working on the azeotropic system.

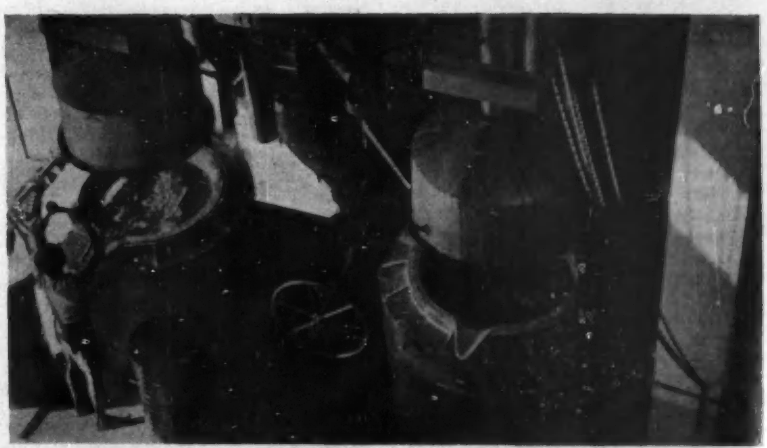
In the conventional system, part of the heat content of the rectified spirit reflux vapours is recovered by pre-heating the feed wash in a dephlegnator-condenser. This step can be avoided, with no disadvantage, by arranging direct heat exchange between the feed wash and the spent wash. The new design affords the same measure of heat economy in the rectified spirit section while making the entire heat content of the alcohol reflux vapours available for re-use in the dehydration system.

In the conventional dehydration of rectified spirit by azeotropic distillation with benzene, the steam consumption is of the order of 10–11 lb. per gallon. With the above technique, this requirement is avoided and absolute alcohol can be produced with no extra consumption of steam than is required for rectified spirit.

Bleaching Powder

Installed capacity of bleaching powder in India is about 13,000 tons of which less than half is usually operative. Principal reason for this idle capacity is the poor demand for indigenous product which has low stability and low available chlorine content. Substantial quantities of bleaching powder are therefore imported. Re-

INDIAN NEWSLETTER



View of the chlorine furnace in the Indian rare earths factory at Alwaye (Travancore-Cochin). Plant capacity of 1,500 tons of monazite a year is shortly to be doubled

cently, a plant for manufacturing stable bleaching powder according to a German process has been commissioned at Mettur Dam in South India.

Chlorination of Hydrated Lime. Chlorine absorption of hydrated lime has been studied at the National Chemical Laboratory, Poona. Absorption was facilitated when hydrated lime was dry and ground to a particle size such that 95 per cent passed through a 200 BS mesh sieve. Limes obtained by calcining limestones at 1,000°C. showed the highest chlorination.

Mineral Wool. A process for the production of mineral wool, an effective thermal and sound insulator, has been developed at the Shri Ram Institute for Industrial Research, Delhi. The raw material employed is press mud from carbonation sugar factories, a waste product, the disposal of which involves considerable expense to sugar manufacturers. While press mud from sulphitation sugar factories is used as a fertiliser, that from carbonation factories has not found any application. A sugar factory crushing 1,000 tons of cane discards 10 tons of press mud daily.

The individual fibres, which are resilient, have the following characteristics: diam., 3–5 microns; porosity, over 90 per cent at a density of 10 lb. per cu. ft.; sp. heat, 0.18; heat resistance; sintering temperature, 1,400°F. and fusion temperature, 2,000°F. The material can be used for insulation up to 1,400°F. It is fire-proof, rot-proof and vermin-proof; it is safe to handle and easy to instal; one ton of mineral wool would cover 25,000 sq. ft. of surface area, 1 in. thick.

It can be bonded into boards, half-round pipe sections and other shapes using special synthetic resins and adhesives.

Substantial quantities of mineral wool from press mud have been prepared in the pilot plant at the Institute. The know-how for large-scale production has been worked out.

Aca-catechin as Antioxidant. Recent investigations at the Regional Research Laboratory, Hyderabad, have shown aca-catechin, a constituent of catechu, to be an efficient antioxidant for fats and oils. The protection it confers is of the same order as that of BHA, propyl gallate or NDGA.

Addition of 0.05 and 0.1 per cent aca-catechin to butterfat increases the shelf storage life from 123 days to 240 and 210 days respectively. Aca-catechin increases the storage life of fried potato chips and biscuits.

CONTINUED PROGRESS REPORTED BY SAC METHODS COMMITTEE

THE GOOD PROGRESS made by the Analytical Methods Committee of the Society of Analytical Chemistry in 1955 has been vigorously advanced. Publication of a number of analytical methods has resulted and the scope of the Committee's activities continues to be expanded.

Various technical committees associated with the Analytical Methods Committee now number 19, compared with 14 a year ago. The individual progress reports contained in the report show that methods for a wide variety of substances are under consideration and priority is being given to those methods for which there is the most pressing need. As many of the projects under consideration by sub-committees and panels involve much collaborative research before standard methods can be recommended, the number of publications appearing in any one year is only a partial indication of the work done.

A very intensive year's work has been completed by the joint committee with the Association of British Chemical Manufacturers on methods for the analysis of trade effluents. Nineteen methods have been published and 11 more are in the press.

Methods of assay on crude drugs are being studied by the joint committee with the Pharmaceutical Society with four working panels collaborating.

Preliminary discussions have taken place between representatives of the society, the Association of British Insecticide Manufacturers and the scientific sub-committee on poisonous substances used in agriculture, fisheries and food.

The sub-committee on metallic impurities in organic matter is preparing a memorandum on the handling and use of perchloric acid, particularly as applied to the destruction of organic matter.

A method capable of measuring with reasonable precision and accuracy all seven methylated tocols of Vitamin E has been the task of the Vitamin-E panel. A paper-chromatographic method was chosen for collaborative study. Separated tocopherols have been assayed by a modification of the Emmerie-Engel colorimetric method. Micro-determination far below the range of the older methods has thus been possible. The panel consider it would now be possible to lay down a provisional method for sufficiently accurate determination of the α-tocopherol in naturally occurring oils and other foodstuffs. As a differential analysis as possible seems essential, the Panel has decided to defer publishing a provisional method.

Results obtained by the sub-committee for the direct micro-determination of oxygen in organic matter using the Unterzaucher method demonstrate the superiority of a carbon-platinum filling in the combustion tube at 900°C. over a filling of carbon only at 1,100°C. A second series of tests now in progress is aimed at reducing the 'blank' value, and of isolating possible sources of error.

The main task of the ABCM/SAC joint committee on methods for the analysis of trade effluents has been to find or devise methods which are not only capable of determining toxic constituents accurately in small quantities but are practical and quick. Account has been taken of the 'Methods of Chemical Analysis as Applied to Sewage and Sewage Effluents' (2nd edit., 1956) published by H.M. Stationery Office.

Silver, although an unlikely contaminant in effluent in view of its value, may have to be determined down to 0.01 p.p.m. because of its extreme toxicity to fish. A satisfactory method has not yet been found.

A new feature in British practice, which is recommended as a standard method, is the dichromate value test, known in the US as COD (chemical oxygen demand). This is stated to have the advantage over the permanganate test of reproducibility and applicability to a wide range of samples. Experimental work has shown that a larger proportion of carbonaceous matter is oxidised than in the permanganate value test.

Draft methods which are nearing completion by this joint committee are for antimony, cyanide, fluoride, phosphorus and synthetic detergents.

Letter to the Editor

Price in US of UK Naphthalene

SIR, We wish to refer to the article on page 16 of CHEMICAL AGE for 6 July entitled 'Phthalic Anhydride' and to state that this company acts as managers for an export scheme handling all UK naphthalene for the US market.

We understand that one of our members, the North Thames Gas Board, has already telephoned you criticising the statement in your article that UK naphthalene is at present selling in the US at a c.i.f. price of 5 cents per pound. We can certify that all British naphthalene so far shipped in the year 1957 for the manufacture of phthalic anhydride has earned a price of not less than 6¼ cents per pound c.i.f.

It seems to us most unfortunate that this statement should have appeared in your columns because in our opinion it can only have the effect of depreciating the market for a commodity which has been an important dollar earner for the UK over a period of years.

Yours etc.

R. G. W. Eadie

Wm. Butler and Co. (Bristol) Ltd.
Managers of the Naphthalene
US Export Scheme

Lower Duty on Some Precision Instruments

THE LIST of gauges and measuring precision instruments on which the rate of duty is not to exceed 25 per cent *ad valorem* is amplified by the Safeguarding of Industries (Reduction of Rates) Order, SI 1180/1957. The added items which include certain balancing machines, block levels, scales and surface-finish testing instruments, are chargeable at the lower level in pursuance of the May 1956 protocol to the General Agreement on Tariffs and Trade.

Overseas News

WEST GERMAN WORK ON ENRICHING URANIUM BY CENTRIFUGING

A centrifuging process, stated to have led to the enrichment of natural uranium by 2 per cent in preliminary experiments has been developed by Professor Wilhelm Groth of Bonn University. Enrichment occurs when uranium hexafluoride gas is led through two centrifuges at 40,000 revolutions a minute.

So successful have these experiments proved that nine larger centrifuges are to be installed at Bonn this year and some 50 centrifuges are to be installed at the North Rhine-Westphalia's new nuclear research centre to be set up at Düren. It is planned that this Düren plant should produce five tons of enriched uranium a year. Cost of production is estimated, in terms of electric power consumed, at between one-eighth and one-tenth of that which is normally required in the diffusion plants at Oak Ridge, US or Capenhurst, UK.

The centrifuges have a diameter of 7.2 in. and are 47 in. high. Two per cent enrichment was obtained in earlier experiments using two similar machines of the same diameter but only 25 in. high. Enrichment per stage depends on the ratio of height to diameter. One of the new machines to be installed later this year will be 118 in. high.

Centrifuging was considered as a promising route to U-235 in the early days of US atomic development. While a pilot plant was successfully operated by Standard Oil Development Co. no large-scale production plant was developed because of engineering problems, in particular, lubrication. However, the Germans are believed to have solved this problem by using a new fluorinated lubricant, Hostaflonoil, produced by Farbwerke Hoechst.

Linde Air Now Have 18 Canadian Plants

Linde Air Products Co. division of Union Carbide Canada Ltd., have acquired Independent Oxygen Ltd., Lethbridge, Alberta. The Lethbridge plant is to be expanded to meet the increasing demand for industrial gases resulting from the economic growth of Southern Alberta. The new plant will bring to 18 the number of industrial gas plants operated in Canada by Linde Air.

Aluminium Foil Most Effective Barrier

Aluminium foil barrier materials have been found most effective for retaining volatile corrosion inhibitor vapours. This is stated in a report published by the Office of Technical Services, US Department of Commerce. Cellulose acetate scrim was also found to be effective. Polyester films were superior to other unsupported plastics films and appear to be suitable for moderately long storage.

The report, No. PB 121893, 'Permeability of barrier materials to volatile corrosion inhibitors at various humidities' may be obtained from OTS, US Department of Commerce, Washington 25, DC, US.

Shell Asphalt Plant Officially Opened

Shell Oil Co. of Canada has officially opened its new asphalt plant at its Montreal East refinery. The new plant is providing Quebec with an additional source of asphalt, said L. Miller, manager of the Shell Montreal East refinery. The plant has been in production since early June.

It cost more than $1 million and has a capacity of 600 tons of asphalt daily. Capable of producing all grades of road asphalts, the plant will operate on feedstock from existing units in the refinery.

Japan and Titanium Sponge Production

Reductions in US defence appropriations are understood to be causing Japanese titanium producers to revise their plans for expansion. Japan has been exporting about 90 per cent of her total output to the US. Nearly all this amount has gone to the US Government for either defence or research purposes.

Japanese exports of titanium sponge during the financial year April 1956 to March 1957 amounted to 2,960 tons, having an estimated value of US$15,281,000. Export targets for the year April 1957 to March 1958 have been fixed at 4,320 tons valued at US$19,034,000.

A recent report has suggested that estimated total Japanese requirements for 1957 are 100,000 tons of ore. Western Australia, it is said, will supply more than 100,000 tons of ilmenite, with a titanium dioxide content of 54–55 per cent, to Japanese consumers during 1957–58.

Dimethyl sulphoxide as Solvent

Commercial production of a new solvent, dimethyl sulphoxide, is announced by Nitroglycerin Aktiebolaget of Sweden. The sulphoxides have proved extremely effective solvents with high selectivity. Dimethyl sulphoxide is strongly hygroscopic and its unusual solubility properties suggest that it will be suitable for a range of special applications, such as a solvent for cellulose esters, a solvent and selective absorbent for acetylene and sulphur dioxide, as a solvent and recrystallisation agent for organic acids, as a selective separation medium for aromatic and paraffinic hydrocarbons, as a spinning liquid for acrylnitrile, proteins and cellulose acetates, etc.

Further details, technical data sheets, and samples can be obtained from the sole selling agents, Guest Industrials Ltd., 81 Gracechurch Street, London EC3 (Telephone No. Mansion House 5631—20 lines).

Research Expenditure by US Chemical Companies

In an article discussing research and development expenditures, K. H. Klipstein, American Cyanamid Co. (*Chem. and Engng. News*, 1957, **35**, 18) gives the cost of research of leading US chemical and pharmaceutical companies.

Company	Net sales $	Research expenses $	Research as a percentage of sales
Allied Chemical and Dye Co.	668.9	17.5	2.6
American Cyanamid Co.	500.7	22.4	4.5
Du Pont	1888.4	77.0	4.1
Hercules Powder Co.	235.9	10.5	4.4
Merck Inc.	172.4	11.5	6.7
Minnesota Mining and Chemical Co.	330.8	12.3	3.7
Monsanto Chemicals	541.9	19.2	3.5
Parke-Davis	134.1	5.4	4.0
Pfizer	178.4	8.0	4.5
Schering	54.6	3.2	5.9
Smith, Kline and French	104.6	7.0	6.6
Union Carbide	1324.5	55.0	4.2

ICI Plant Supplies Australia's Soda Ash Needs

Alkali plant of Imperial Chemical Industries Alkali (Australia) Pty. Ltd. at Osborne, South Australia, produces 115,000 tons of alkalis a year, using salt from the nearby salt fields and limestone from a quarry at Penrice, 50 miles away. The plant supplies the whole of Australia's requirements of soda ash and about half its caustic soda. The salt is obtained by evaporating sea water run into brine ponds from St. Vincent's Gulf. (Photo by courtesy of Australian News and Information Bureau.)

Further Easing in Selenium Market

Following the announcements of price reductions in the US and UK for selenium, there is the recent note from the US that the Bureau of Foreign Commerce there has allowed a three-quarter suspension of export quota limitations. Because of the improved supply position relaxation on some selenium materials is possible. The

selenium compounds in question are the metal, ferroselenium, powder, selenium-containing chemical compounds (including pigments), and acid. Previously, exports in the second quarter were limited to 30,000 lb. (selenium content).

New Copper Sulphate Plant in India

A new plant at Alwaye, Kerala, in India has been commissioned by the Travancore Chemical and Manufacturing Co. Ltd., for the production of 3,000 tons annually of copper sulphate. This is expected to meet India's total need for this fungicide. The plant is expected later to produce other fungicides such as copper oxy-chloride and cuprous oxide.

Haifa Company's Bid to Build Burmese Fertiliser Plant

Israel's chemical combine, Fertilisers and Chemicals, of Haifa, is to submit a bid for the construction of a superphosphate plant in Burma. It is understood that the company's technical section is completing a tender based on the method used by Fertilisers and Chemicals of preparing superphosphate from rock phosphate using sulphuric acid. Also a second offer is to be tendered for a plant to make 45 per cent triple superphosphate by a process which is being developed by the company and the Israeli Ministry of Development, using elemental sulphur.

This second process, according to reports, only requires initially half the sum required for the plant using the former process, and results in lower production costs and uses less raw materials.

Burma's nearest sources of phosphate rock are Israel and Jordan.

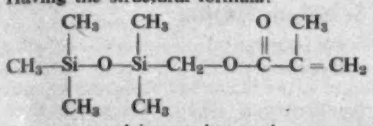
Process for Fresh Sodium Dispersions

A process for on-site sodium dispersions is being offered by the U.S. Industrial Chemical Co. In this process high velocity tangential shear produces the sodium dispersion. High-speed impellers are used or the metal is pumped through an orifice with a gear pump.

Dispersion is performed at 100° to 115°C. and a dry nitrogen atmosphere prevents exposure to air. Agitation for 5 to 20 minutes yields sodium particles 10 to 15 microns in diameter, the company state. The mixture is allowed to cool.

New Compound for Polymers and Copolymers

Polymers and copolymers having unusual bonding and surface characteristics can be formed from penta methyldisiloxanemethyl methacrylate, Syl-Kem 21, developed by Dow Corning Co., US. Having the structural formula:



the compound is stated to undergo many reactions typical of methacrylate esters.

This organo-functional silicone has the following properties: a clear liquid, boiling at 86.5°C. at 10 mm. Hg.; refractive index, 1.4202 at 25°C., density 0.903. It polymerises readily in bulk, emulsion or suspension producing a clear tough plastic with a molecular weight of from 600,000 to 700,000. The polymers are soluble in acetone or benzene.

Copolymerised with acrylonitrite, styrene, vinyl acetate or methyl methacrylate, this Dow chemical compound yields plastics with unusual surface properties. With methyl methacrylate polymers having low coefficients of friction against steel surfaces are produced. With a 30 per cent content of Syl-Kem, a minimum coefficient of 0.03 is reported. Dow Corning go so far as to state that the polymer compares favourably with p.t.f.e. (coefficient of 0.05) and polystyrene (coefficient of 0.15). The product is also water repellent.

Pilot plant quantities are available of this silicone compound.

Buna-Werke Huels Capital Increase

Buna-Werke Huels, destined to become Western Germany's main synthetic rubber producer has had its capital increased from DM 120,000 to DM 42 million.

Plant installations are expected to be completed by the summer of 1958. Annual production is estimated at 45,000 to 50,000 tons of synthetic rubber, just over a quarter of West Germany's total rubber requirements.

Mexico's Sulphur Industry—Nationalisation Hint

Press reports from Mexico City suggest that Mexico may soon nationalise its sulphur industry. The head of the Sulphur Workers' Union is reported to have asked President Cortinez to do this. The Senate Mining Commission in April recommended expropriation of the flourishing foreign-controlled sulphur industry, alleging that concessions were being mishandled. Several US companies are in control of Mexican sulphur production or are financing it.

Saint Gobain's Output Rise was Above French Average

Manufacturers of glass and chemical products, Saint-Gobain SA (Saint-Gobain Channy and Cirey), Paris, report that expansion of production which had been taking place in France since 1953 continued during 1956, although at a slower rate than in 1955.

In comparison with the official OEEC statistics that the output of the French chemical industry showed an increase of 8 per cent, Saint-Gobain's output increased by rather more than 9.3 per cent for the year. Demand for sulphuric acid remained at a high level and a new plant at Rouen came into operation during the year.

In the organic chemical field the company engaged in a programme of plant extension and modernisation. Total tonnage sold showed an increase of 16 per cent as against 1955.

Indian Tariff Enquiry

The Indian Government is to set up a Tariff Commission enquiry into the stearic acid industry.

Chilean Report Calls for a $4 Million Loan for Nitrate Industry

A REPORT on the Chilean nitrate industry makes a number of financial recommendations, but calls on the Government of Chile not to grant any direct subsidy to the nitrate producers, as this would postpone the rationalisation 'which the industry so urgently needs'. The report was prepared at the Government's request by Klein and Saks, the economic consultants, who state that a quick policy decision based on their recommendations is necessary.

Although the suggested programme is costly, it is said to offer the promise of an eventual solution of the industry's problems, which in the present situation might mean that industry could not carry out its modernisation and reorganisation programme, thereby becoming a burden on the country, instead of the asset it should be.

Among the recommendations is a call to recognise the need to provide realistic incentives to the country's exporting industries, including elimination of the difference between the rates of exchange for exports and for imports. From the funds available from the sale proceeds of surplus US agricultural products, the Government is asked to grant a total of US $4.2 million in the form of long-term loans under adequate controls to the Anglo-Lautaro Nitrate Corporation and to the Cia. Salitrera de Tarapaca y Antofagasta (COSTAN).

In the case of Anglo-Lautaro, conditions of the loan should be completion of the firm's expansion programme within the next three nitrate years and the use of at least a part of the loan to build 1,000 houses for an increased workforce. The conditions for COSTAN should involve speeding up of the company's improvement plans so as to complete them within four years instead of six. The company should undertake to close all the Shanks plants and to adopt the granulation process by the end of the nitrate year 1957-58. In addition the company should pay no dividends and refrain from redeeming non-interest bearing bonds for not less than three years.

A complete revision of COSTAN'S debt and capital structure with the object of introducing improvements is also called for. The Government is asked to abstain from any measures that would interfere with the gradual closing of the remaining Shanks plants that show no possibilities of economic production. The Chilean banking system should finance the 'carry-over' stocks of nitrate and financing of each ton of nitrate should be based not on production costs, but rather on the probable receipts from sales.

TIN RESEARCH INSTITUTE CELEBRATES SILVER JUBILEE

New Work Shown at Open Days

TO CELEBRATE its 25th anniversary, the Tin Research Institute at Greenford opened its doors last week to scientists and technologists of the world. The International Tin Research Council was formed in 1932 to plan an organisation to increase the world consumption of tin research and development, and the present laboratories were opened in 1938 when it became clear that the policy of 'farming out' research to university laboratories was unsatisfactory for the practical needs of tin producers.

Since 1945 the aim of the Council has been to discover entirely new uses of the metal, to improve existing products and processes, and to counteract, where desirable, the introduction of substitutes. In 1951 new laboratories were opened at Greenford, doubling the floor space.

Tinplate accounts for roughly 40 per cent of the world's tin consumption. During the last 25 years a revolution has taken place in the tinplate industry, with the change from hot-pack rolled steel sheet to cold-reduced steel sheet and the introduction of electrolytic tinning to replace hot-dipping. The Tin Research Institute has played a large part in investigating the relations between tin and steel in the coating process, both by hot-dipping and by the electrolytic process, and the provision of methods of testing quality.

Tinplate Handbook

The Council's experience of research in its relation to industry has resulted in some valuable publications for industry. The most recent example is the *Tinplate Handbook*, 35,000 copies of which have been freely circulated throughout the world. Most factories that use solder have the Council's *Notes on Soldering*, a 90-page book of which 55,000 copies have been distributed.

Perhaps one of the most interesting modern developments in tin research is in the exploitation of organotin compounds, chemical compounds of tin in which the tin atom is directly linked with at least one carbon atom. In a sense these compounds are half-way between the ordinary chemical compounds of tin and organic substances.

Basic research into organotin compounds has been entrusted to the Organisch Chemisch Instituut, T.N.O., Utrecht, Holland, and their use in fuels, lubricants, detergents, paints, plastics, insecticides, fungicides, weed killers, pharmaceuticals, textiles and rubber is being investigated. Some organotin compounds with certain groupings of atoms are toxic, whereas tin itself is completely non-toxic. There is a possibility of controlling the general degree of toxicity by changing the configuration of the organotin molecule and a further possibility of obtaining selective toxicity towards different forms of life, such as animals, plants, fungi and bacteria. Success in this aim is providing new materials for fungicides and insecticides to be used in pest control for growing crops, in the preservation of wood, the moth-proofing of wool, the rot-proofing of jute, the mould-proofing of paint, the eradicating of soil pests and for many other purposes in a vast range of industries. It might also yield useful new medicines. A new application which has already been noted is the use of tributyltin compounds to prevent the formation of disfiguring moulds on paints in damp situations.

Great advances in electro-tinning have been made in the last 25 years. Tin-nickel alloy electroplate, a recently developed coating containing two parts of tin to one part of nickel, can be applied to steel, brass, nickel-silver, zinc and other basis metals. It can be used as a substitute for chromium plate. Another commercially successful tin-alloy electroplate is tin-zinc alloy, containing three parts of tin to one part of zinc. In its electrochemical relation to the steel which it protects, tin-zinc alloy resembles cadmium and can often be used in place of cadmium with economic advantage.

For the future, the International Tin Research Council look forward to even more uses for tin, both as a handmaid to the new metals such as titanium, and through its organic chemical compounds.

56 Chemicals Added to KID List

A FURTHER 56 chemicals have been added to the list of chemicals liable to Key Industry Duty. The order effecting this, which came into operation on 22 July, is the Safeguarding of Industries (List of Dutiable Goods (Amendment 13) Order.

p-Acetoxybenzoic acid; *n*-acetylsulphanilyl chloride; 2-amino-4:6-dimethylpyrimidine; 2-amino-5-methyl-1:3:4-thiadiazole; 6-aminothymol; azobenzene-4-sulphonic acid; monobromomonochloro-1:1:1-trifluoroethane.

Cadmium *n*-decoate; carbodicyclohexyldi-imide; 2-chloro-1:4-dimethoxybenzene; 2-chloro-10-(3-dimethylaminopropyl)phenothiazine; 2-chloro-10-(3-dimethylaminopropyl)phenothiazine hydrochloride; *o*-monochloro-*n*-octoic acid; 2-chlorophenothiazine; 1-[3-(2-chloro-10-phenothiazinyl)propyl]-4-methylpiperazine; 1-[3-(2-chloro-10-phenothiazinyl)propyl]-4-methylpiperazine hydrochloride; 1-[3-(2-chloro-10-phenothiazinyl)propyl]-4-methylpiperazine maleate; *o*-monochloropropionic acid; 2-chloroquinoxaline; monochloro-1:1:1-trifluoroethane; monocyanoacethydrazide.

2:7-Diaminofluorene; dibenzyl disulphide; di-*n*-butyltin diacetate; 1:3-dichloro-5:5-dimethylhydantoin; dichloromethyl cyanide; diethylammonium salicylate; 3:4-dimethoxyphthalic acid; 2:5-dinitrofluorene; di-*n*-octyltin dilaurate; di-*n*-octyltin maleate; di-*n*-octyltin oxide; 2:4-distyrylphenol.

4-Hydroxyazobenzene-4'-sulphonic acid; *p*-hydroxybenzylacetone; indoxyl *n*-butyrate; monomethyldichlorosilane; 3-methyl-1-phenylpentan-3-ol; 3-methylpiperidine; morpholinium salicylate; *p*-nitrophenyldiazonium fluoroborate; phenoxyacetamide; phenoxyacet-2-hydroxyethylamide; phenylacet-2-hydroxyethylamide; prednisolone; prednisolone acetate; prednisone; prednisone acetate; propionylthiocholine chloride.

Sodium *p*-monochloropropionate; sodium 2-hydroxypropane-1-sulphonate; sodium isethionate; sodium *N*-lauroylsarcosinate; sodium propene-3-sulphonate; thiazole; *o*-2:4:5-tri-iodophenoxy-*n*-butyric acid.

KID Changes

The description under which certain calcium tungstate and sodium iodide crystals are exempted from Key Industry Duty are described in the Safeguarding of Industries (Exemption) (No. 2) (Amendment) Order SI 1181/1957, which came into force on 5 July.

One-day Joint Meeting on Control of Chemical Additives in Food

A ONE-DAY joint meeting on the control of chemical additives in food will be held on Friday, 26 July, at the Royal Institution, 21 Albermarle Street, London W1. It is being held by the Food Law Institute of the US, the food group of the Society of Chemical Industry, the Society for Analytical Chemistry and the Association of Public Analysts.

The morning session will deal with the control of chemical additives in food other than antibiotics; the afternoon session will include special reference to antibiotics. Dr. J. Hamence, SAC president, will introduce the morning session chairman, Mr. C. W. Dunn, president, Food Law Institute of the US. Sir Harry Jephcott, chairman, Glaxo Laboratories Ltd. and chairman of the DSIR Advisory Council, will preside at the second session.

Papers will be given as follows: *morning*: G. P. Larrick (Commissioner of Food and Drugs, US Food and Drug Administration) and Dr. A. J. Lehman (director of the division of pharmacology, US Food and Drug Administration); Dr. C. A. Morrell (director of the Canadian Food and Drug Directorate); Dr. N. C. Wright (scientific adviser to the Ministry of Agriculture); Dr. E. J. Miller (plant pathology laboratory, Ministry of Agriculture); *afternoon*: Dr. H. Welch (director, antibiotics division, US Food and Drug Administration), Dr. Morrell and Dr. F. S. Thatcher (chief of the microbiology laboratory, Canadian Food and Drug Directorate); and A. L. Bacharach (chairman, *sous-commission* on antibiotics in food, appointed by the Commission Internationale des Industries Agricoles and the Bureau International Permanent de Chimie Analytique).

Visitors are welcome to attend this meeting and will not require tickets.

Draft BS on Radiation Hazards

'METHOD for the determination of the freezing point depression of milk (Hortvet method),' No. CX5407, is among draft British Standards in the course of preparation. Draft comments are welcome and if received by the end of July will be taken into consideration before publication.

Other draft standards open to comment include: 'Methods for the analysis and testing of coal and coke, part 9. Phosphorus' (CX5635) and 'Precautions against radiation hazards in industrial radiography' (CX5684).

Copies of each may be obtained, price 2s., from BSI, 2 Park Street, London W1.

Chemist's Bookshelf

TECHNOLOGY OF POLYTHENE

POLYTHENE: The technology and uses of Ethylene Polymers. Edited by *A. Renfrew* and *Phillip Morgan*. Published for *British Plastics* by Iliffe & Sons Ltd., London. Pp. 642 + 75 pp. of art plates. 126s.

In terms of tonnage, polythene is well on the way to becoming the most important plastics material. New uses are continually being found and major outlets at present include packaging film, cable insulation and sheathing, cold water and chemical piping, paper-coating, and mouldings for industrial and domestic purposes. By 1960, world production capacity will be at least 700,000 tons per annum and in 1965 the yearly demand may be as much as 1,500,000 tons.

These bare facts imply both the versatility of polythene and the rapidly growing interest in this remarkable material. Information about polythene is now being sought by technologists in many different industries and for this ever-increasing band even a collection of already published information would provide a useful service. This new book, however, is far more than a mere survey of the literature: all of its 32 chapters have been specially written; no less than 38 contributors are named, among them many acknowledged leaders in polythene technology; the approach has been critical rather than synoptic. The book has been edited by a well-known scientist from the company which pioneered polythene and by the editor of a leading plastics journal.

An Outstanding Book

The result of all these labours is an outstanding book which should be bought by all whose work brings them into the orbit of polythene processing and application, as well as those directly concerned with the manufacture of the material itself.

This being said, a few criticisms can be made. The book is divided into three main parts; manufacture and properties; processing techniques; and applications and prospects. Generally speaking, the chapters in part 1 are of a higher standard than the others and are more clearly and concisely written. The section on molecular structure is extremely well conceived and lucidly expounded, as is the chapter on general mechanical properties. In part 2, the chapter on injection moulding is very good and the four chapters on extrusion are very useful, although more attention might have been given to the importance of selecting the correct extrusion compound, particularly when producing film and lay-flat tubing.

Part 3 of the book is the least satisfactory. The section on chemical plant is disappointing and gives rather an odd impression of the importance of polythene in this field. However significant its applications, it can never compete with unplasticised p.v.c. in terms of quantity. It is a weakness of the whole book that design considerations are erratically treated. The chapter on pipe discusses design in detail; but that on chemical plant does not. In particular, little reference is made to the need for designing equipment along lines which fully exploit the unique characteristics of polythene. Fabricators have been content for too long to make do with techniques originally developed for conventional substances instead of devising new methods for the new material and, in this connection, it is regrettable that the spirit of 'critical appraisal' mentioned in the preface is somewhat lacking.

Occasionally the reader is frustrated by inconsistencies. For example, a table showing projected world production capacity gives tonnages for all of the companies in countries outside the US; but not those of companies in the US itself. To discover how the American tonnage is made up the reader is referred to another chapter; but the figures are not included there, either.

While the book includes virtually all that is known about branched polythenes, its account of linear polythenes is far less extensive. There are good reasons for this. The book was originally conceived prior to the announcement of the development of the low-pressure materials and most of the work had been written when details were first made known. Even so, although only a limited amount of information was available (because of commercial considerations) the reviewer understands that all of the chapters were sent back to the authors for revision and extension. Seen in this light, the work makes a praiseworthy attempt to deal with one of the most stimulating developments in the history of polythene.

There can be no question as to the usefulness of this book, which, in general, provides a first-class source of information.

PATRICK MOXEY

Comprehensive Account of Catalysis

CONTACT CATALYSIS. By *R. H. Griffith* and *J. D. F. Marsh*. Clarendon Press: Oxford University Press. 1957. Pp. x + 299. 50s.

This book is the third edition of 'The Mechanism of Contact Catalysis', of which the second edition appeared in 1946. However, so much new information has come to light in the last decade that this is virtually a new book.

The plan of the book is good. The first chapter gives an account of the preparation and evaluation of catalysts which is comprehensive and yet readable. Much new information is gathered together under the heading of the examination of the catalyst surface and this is followed by a brief but adequate account of adsorption. In line with modern ideas, catalytic activity is treated both from the view-point of the electronic nature of the catalyst and also in relation to the geometry of the catalyst surface. Separate chapters are devoted to promoters and carriers, and to poisoning and allied phenomena.

The authors have singled out the reactions of hydrocarbons as a topic requiring special treatment and it is interesting to see that only one of the 35 references that they quote is to a publication earlier than 1946. After a chapter on the mechanism of catalysis, the final chapter serves the dual role of summarising the rest of the volume and of indicating the roads along which the subject is likely to develop.

Undoubtedly the authors have succeeded in their difficult task of giving a comprehensive account of catalysis within the scope of a single volume. They have produced a sound and readable book and part of their success is attributable to their judicious selection of material. They have avoided the pit-fall of giving too lengthy accounts of those aspects of the subject where a multitude of publications have still left the picture incomplete. Thus, they have achieved a treatment which is even and balanced. The book has a good subject index and also an author index. It is unfortunate that names are misspelt in a number of places.

The book should prove invaluable to teachers and students and can be recommended most strongly to all who wish to have a comprehensive and balanced account of the subject. It has much to offer to the specialist as well.

C. KEMBALL

Careers Directory

DIRECTORY OF OPPORTUNITIES FOR SCHOOL LEAVERS. Cornmarket Press Ltd., London. 1957. Pp. 116. 8s 6d.

A series of entries from organisations wishing to recruit school leavers makes up the main part of this book. Details are given about the employment or apprenticeship offered, including location, salaries, prospects and amenities. A total of 30,000 copies are sent free of charge to schools which educate boys or girls up to the school leaving age. Youth employment officers, careers advisory officers and the Public Schools Appointments Bureau will also receive complimentary copies.

The book was compiled under the editorship of Mr. Clive Labovitch, working with an editorial advisory board consisting of Mr. F. L. Allan, chairman, careers committee, Incorporated Association of Headmasters, Mr. D. G. Chambers, general secretary, Public Schools Appointments Bureau, Mr. E. D. Foster, editor, *The Director*, and Mr. R. W. Pennock, central staff department, Imperial Chemical Industries Ltd.

A glance at the names on the board will show that the book is authoritative. Every profession and type of industry is represented, and every school leaver, or person concerned with the school leaver's future, would do well to study it.

J.P.S.J.

1,800 Page Survey of Organic Synthesis

ORGANIC SYNTHESIS. Vol. I and II. By *V. Migrdichian*. Reinhold Publishing Corp., New York: Chapman and Hall Ltd., London. 1957. Pp.; Vol. I xxviii + 832, Vol. II xiii + 980. 280s.

Most organic chemists interested in the synthetic aspects of the subject accumulate for themselves either a tidy card-index or an untidy series of notebooks containing useful references to methods and techniques of personal interest. When not dealt with by a recent review such details of methodology are time-consuming to unearth from the literature, and therefore any compilation entitled 'Organic Synthesis' (*tout court*) will command immediate attention.

These two volumes are described by the publishers as the 'most systematic, fully integrated and up-to-date presentation of organic synthesis in all its aspects ever published . . . so complete and so precise in its coverage of the subject that it surpasses even specialised texts in each and every phase of this vast field'.

The most astonishing factor of this 1,800 page survey is that it is the work of one man, and one can only stand awe-struck at such industry and fortitude. Unfortunately this fact lies at the heart of some of the drawbacks of the volumes, because, with the best will in the world, a single individual cannot easily present a balanced critical account of fields not personally experienced.

The coverage comprises acyclic saturated and unsaturated compounds, alicyclic compounds and aromatic compounds and such recent topics as carotenoid synthesis, steroid synthesis and tropolones are touched upon. The presentation of formulae is rather ungainly and conducive to errors and the danger of confusion between benzene and cyclohexane rings is ever present.

Although these volumes will no doubt prove of use for obtaining a leading reference rapidly, it is unlikely that they will cause most organic chemists to dispense with their own compilations, especially in view of the price. R. A. RAPHAEL

PREPARING A REPORT

CHEMICAL ENGINEERING REPORTS. How to Search the Literature and Prepare a Report. By *Kenneth A. Kobe*. 4th edition. Interscience Publishers Inc. New York. Interscience Publishers Ltd., London. 1957. Pp. viii + 175. $3.

For a number of years Professor Kobe, who is Professor of Chemical Engineering at the University of Texas, has given a course on report writing to his students. His text is now published in book form.

After an introduction describing the technique of making a literature search the book goes on to discuss various types of report, giving hints on the style to be adopted and the arrangement of matter.

Everyone from the student to the experienced chemical engineer should find something of interest in this book. Unfortunately the printing style adopted, typewritten pages produced by an offset process, tends to make the book rather bulky. J.P.S.J.

Chemist's Bookshelf

Analysis by Instrument

INSTRUMENTAL ANALYSIS. By *Paul Delahay*. The Macmillan Co., New York and London. 1957. Pp. xi + 384. 55s 6d.

The text of this new book covers most of the important methods of instrumental inorganic and organic chemical analysis. Its scope is wide. The introductory chapter classifies methods into three broad categories *viz.*, electrochemical methods, those concerned with the absorption or emission of radiation, and miscellaneous methods not falling within the previous categories.

Chapters are devoted to: potentiometry; electrode potentials; polarography and related titrimetric processes; electrogravimetry and coulometric methods; conductometry and high-frequency analysis; emission spectroscopy; absorption spectrometry and filter photometry; fluorimetry, turbidimetry and nephelometry; Raman spectroscopy; X-ray analysis; mass spectrometry; nuclear radiation methods. The final chapter is concerned with laboratory exercises.

Each chapter contains a bibliography and a series of problems designed (a) to extend the theory already given, (b) to stimulate knowledge of the applications of the method and (c) to encourage survey of the literature.

This text is well suited to the teaching of modern instrumental methods of chemical analysis in British universities and technical colleges at postgraduate or equivalent level. It is a book that no graduate student engaged on research work in analytical chemistry should be without. It surpasses most textbooks concerned with the same subject matter in its fundamental approach to the principles and important aspects of modern instrumentation. No space is wasted on photographs, block diagrams of instruments and complicated circuits.

Students trained by the Delahay method will understand what goes on behind the control panels of their instruments in principle even if not in detail. Those circuits which are presented are simple and basic without any of the special devices which manufacturers normally build into their instruments. This is an extremely important point, since few chemists are sufficiently skilled in electronic circuitry to comprehend more complicated schemes. The simplicity of these circuits will encourage rather than discourage understanding by the student.

The bibliography is thorough and the threefold nature of the problem or review question section must be singled out for special mention. The author has obviously given considerable thought and attention to this aspect of his subject and the intelligent student will gain immeasurably by careful attention to this section of each chapter. The experiments detailed in the ultimate chapter are designed to stimulate fundamental knowledge of the physico-chemical background to instrumental analysis rather than the superficial aspects of application.

Throughout the whole book, the treatment is lucid and it is almost entirely free from the tacit assumptions of specialised knowledge made by many experts in writing their textbooks. At the same time it avoids the all too common pitfall of playing down the subject matter to too elementary a level.

It is difficult to assess the role which this important new book might play in technological education in Britain where far too scant attention is paid to the teaching of analytical chemistry in our colleges and universities. It is regrettable that probably nowhere in this country could the text be used in its entirety, but most certainly none of our teaching institutions could fail to gain by teaching large sections directly from the pages of this moderately priced and well turned out book. Viewed from every point of vantage this book is indeed excellent. T. S. WEST

Dealing with Laboratory Hazards

SAFETY IN THE CHEMICAL LABORATORY. By *H. A. J. Pieters* and *J. W. Creyghton*. 2nd edition (revised and enlarged). Butterworths Scientific Publications, London: Academic Press, Inc., New York. Pp. xiv + 305. Figs. 54. 40s (by post 41s 10d).

The principal changes in the present edition consist of the inclusion of copious additional references in the bibliographies to publications that appeared in the period 1950–56. The text has been improved where clumsy statements previously appeared. There are numerous small insertions in the text which extend the range of hazards covered.

In the section on toxicity and chemical constitution the nitrogen mustards are now treated briefly, although it is surprising that, apart from additional references, there is no extension of the section dealing with carcinogens.

There has been appreciable re-writing of the section on safety instructions and regulations. The chapter on analysis now contains additional methods for the determination of carbon monoxide, carbon dioxide, ammonia, hydrogen sulphide, aldehyde and fluoride in the atmosphere. There are useful new tables of incompatible chemicals, tentative threshold limit values, and the toxicities of a selection of non-metallic inorganic compounds and organic compounds.

The additions make the book still more useful to workers in the laboratory, and especially to those in charge of laboratories. The recognition of hazardous situations and a knowledge of how to prevent them, or, in the unfortunate event, to counter their effects, should be part of the training of every chemist. Even to browse through this book occasionally is bound to make the chemist safer—safer himself, and safer as a colleague in the laboratory. CECIL L. WILSON

PEOPLE in the news

● The following appointments have been made by the council of the Royal Society: PROFESSOR E. N. DA C. ANDRADE, F.R.S., has been appointed Rutherford Memorial Lecturer for 1957, to deliver the lecture in Australia during September–October. PROFESSOR P. M. S. BLACKETT, F.R.S., has been appointed for 1958, to deliver the lecture in Canada. MR. S. L. SURANGE, a graduate of the University of Lucknow, now working at the National Physical Laboratory of India, has been appointed Rutherford Scholar for three years from 1 October 1957, to carry out research in low temperature physics at the Royal Society Mond Laboratory, Cambridge.

● MR. S. S. DONE, chief chemist of Sissons Brothers and Co. Ltd., Hull, has been appointed technical director. Mr. Done joined the firm in 1949 after spending more than 19 years in India. He has served on a number of technical committees both with the Paint Research Station and the National Paint Federation. He is chairman of the Hull branch of the Oil and Colour Chemists' Association. MR. A. D. SNOWDEN has been appointed chief chemist in succession to Mr. Done.

● Two special directors appointed to the Board of Amber Oils Ltd. are MR. V. E. BAKER, as commercial director, and MR. E. G. REYNOLDS, as works director. Mr. V. E. Baker has been with the Amber Group of Companies for nine years in various capacities, having been engaged in the oil and chemical trades for over 20 years, nine of which were spent with Thomas Hedley and Co. Ltd. Mr. E. G. Reynolds has also been with the Amber Group of Companies for nine years, having been engaged in various engineering appointments over a period of 22 years.

● MR. P. GOUDIME, managing director of Electronic Instruments Ltd., Richmond, was elected president at the annual meeting of the Scientific Instrument Manufacturers' Association held at the Savoy Hotel on 5 July, in succession to MR. G. A. WHIPPLE, chairman and managing director of Hilger and Watts Ltd. Mr. Goudime, who formed the company in 1945, is also a director of the Minerva Detector Co. which he founded in 1950. The EIL group now has branches in France, Canada and Australia. Vice-presidents are: Mr. Whipple, and MR. R. BARRINGTON BROCK, director of Townson and Mercer Ltd.

Other officers elected are: hon. secretary, L. A. WOODHEAD (Cossor Instruments Ltd.); hon. treasurer, P. J. ELLIS (R. B. Pullin and Co. Ltd.). New council members and the sections they represent are: optical, G. C. OTTWAY (W. Ottway and Co. Ltd.), P. D. SCOTT MAXWELL (Cooke, Troughton and Simms Ltd.); electronic, A. W. JONES (Fleming Radio (Developments) Ltd.); nucleonic, H. A. LUSS (Isotope Developments Ltd.); northern area, A. HOWARTH (Fielden Electronics Ltd.).

At the Fulmer open day, R. H. Nicholls, parliamentary under secretary, Ministry of Works, left, with Sir Ben Lockspeiser, the Institute director

(See last week's report of Fulmer Research Institute's open days, p. 61.)

● MR. MICHAEL JOSEPH BAYES, leather chemist with J. Brooksbank Ltd., tanners, Skipton, Yorks, was married on 13 July at St. Paul's, Shipley, to MISS VALERIE JACKSON of Shipley.

● MR. FRED SCHOLEFIELD, M.SC., F.R.I.C., a past-president of the British Association of Chemists, has received an Insignia Award in Technology from the council and executive committee of the City and Guilds of London Institute. He is dyestuffs adviser and secretary of the dyestuffs committee of the British Chemical Manufacturers' Association.

● DR. W. R. MOORE, senior lecturer in Physical Chemistry at Bradford Institute of Technology, is to give a paper at the international symposium to be held by the International Union of Pure and Applied Chemistry at Prague in September.

● The appointment of MR. G. W. M. LUSH to the post of managing director of a new company, the Birfield EngineeringLtd. has been announced by the Birfield Group. MR. D. BASTOW, B.SC., M.I.MECH.E., and MR. E. J. RADSON, A.M.I.MECH.E., will also be directors of the new company, whose headquarters will be in Birmingham adjacent to the factory of Hardy Spicer Ltd. in Chester Road, as soon as building has been completed.

● DR. ALEXANDER MCGOOKIN, D.SC., PH.D., A.R.I.C., senior lecturer in organic chemistry at Liverpool University, is to retire on 30 September. He is a former member of the council of the Chemical Society.

● MR. ROBERT RITCHIE, northern manager of Klockner Moeller England Ltd., electrical control gear manufacturers, Princes Buildings, Oxford Street, Manchester, has been appointed technical director.

● The Whitworth Society has elected MR. ERNEST MARKHAM, director and sales manager, Peter Brotherhood Ltd., compression and refrigeration engineers and chemical plant makers, as president. Mr. Markham, who is 62, is one of the youngest members of the society to hold the office of presidency.

● MR. M. SEAMAN has moved from the board of British Oxygen Engineering Ltd. to the board of British Oxygen Gases Ltd., where he will be director responsible for equipment manufacture.

● SIR ROBERT ROBINSON, OM, a director of the Shell Chemical Co. Ltd. was married on Monday at Caxton Hall, London, to MRS. STEARN HILLSTROM, of the US. Nobel prize winner for chemistry in 1947, Sir Robert is a past president of the British Association, of Royal Society and Chemical Society. Among guests at the wedding was Professor Edward Andrade. Sir Robert and Lady Robinson will be attending the congress in Paris next week of the International Union of Pure and Applied Chemistry.

● MR. G. S. WEBSTER, who has been placed in charge of the Stoke-upon-Trent sub-office of the English Electric Co., will be responsible for the sale of all products.

● The Ministry of Power have appointed additional members to the Fuel Efficiency Advisory Committee. The new members are DR. D. T. A. TOWNEND, director general of the British Coal Utilisation Research Association, and DR. A. C. MONKHOUSE, director of the Fuel Research Station of the Department of Scientific and Industrial Research. The appointments have been made to fill the position left open by the death of Dr. G. E. Foxwell and the absence of Mr. W. L. Boon, who is abroad.

UK AEA Annual Report

Third annual report of the UK Atomic Energy Authority is to be laid before Parliament on Wednesday 24 July at 10a.m.

Commercial News

No Free Trade Advantage to Laporte Group, says Chairman

TOTAL sales of the five manufacturing subsidiaries in the UK and Australia, of Laporte Industries Ltd., during the year ended 31 March last increased by 13.77 per cent, chairman, Mr. L. P. O'Brien, reported at the 50th annual meeting. Group surplus at £2,596,697 showed an increase of £186,406 (7.73 per cent) over the previous year. Group income before taxation at £1,774,443 showed an increase of £86,788 which is 5.1 per cent higher than any previously recorded figures. Net income of the group, however, after tax at £849,484 (1956, £719,549), had left £909,177 which was a reduction of £26,334 (2.8 per cent).

Total value of projects authorised at 31 March was £3,815,000 with commitments for orders valued at £1,950,000. Expenditure will be for expanding production capacity for the company's old staple products, making some new ones, improving outmoded plants and equipment, and building new laboratories, etc., in Great Britain and Australia.

Capital expenditure on fixed assets over the last four years has totalled £5,029,603. The company, to conserve its liquid resources, therefore, recommended an unchanged final dividend of 11 per cent, less tax, making a total of 16 per cent for the year.

Commenting on the European Free Trade Area, Mr. O'Brien stated that he could think of no direct advantage that could accrue to any company in the Laporte Group. 'We have no natural advantages over our West European opposite numbers, who are efficient and well equipped to supply the requirements of their own nationals. It is important that there should be anti-dumping protection in all the countries concerned.'

Borax Holdings

Stock of Borax (Holdings) has risen from 30s 4½d to 36s, while in the US, US Borax Common rose from $56 to $74½. These sharp rises in share prices are considered to be connected with reports of rocket fuel developments and also with reports that Olin Mathieson Chemical Co. is to build a $36 million factory to manufacture boron fuels (see CHEMICAL AGE, last week, p. 70).

The latest suggestion is that the price of these fuels is likely to fall sharply and that they may be used to power US B-58 jet bombers. At present, the main demand for boron fuels is for guided missiles. Immediate use of these fuels, however, is likely to be restricted to ramjets and as a booster function in the after-burners of conventional jets because of the high temperatures involved.

It appears that there is a strong demand for boron fuels from the US military and that much investigative work is being carried out in the US.

British Tar Products

Trading profits of British Tar Products have increased from £87,298 to £106,598. Therefore, in addition to maintaining the dividend at 25 per cent, less tax, for the year to 31 March 1957, the company is recommending a capital bonus of 5 per cent, tax free. Net profit was £38,293 (£30,322).

INCREASES OF CAPITAL

JOHN COLLIER AND CO., LTD. (formerly J. C. (Liversedge) Ltd.), The Soap Works, Valley Road, Liversedge. Increased by £60,793, beyond the registered capital of £100.

PHARMACEUTICAL PRODUCTS LTD., 61 Welbeck Street, London W1. Increased by £4,900, beyond the registered capital of £100.

SYNTHITE LTD., manufacturers of formaldehyde, etc. Ryders Green, West Bromwich. Increased by £100,000, beyond the registered capital of £300,000.

TITANINE LTD., Sheaveshill Avenue, Colindale, London NW9. Increased by £60,000, beyond the registered capital of £100,000.

WHITCROFT CHEMICALS LTD., 13 Stratford Place, London W1. Increased by £1,000, beyond the registered capital of £100.

LONDON GAZETTE

Voluntary Winding-up

(A resolution for the voluntary winding-up of a company does not necessarily imply liabilities. Frequently it is for purposes of internal reconstruction and notice is purely formal.)

E. H. BRITTAIN LTD., manufacturing chemists, regd. office, Gem Works, The Green, Southall, Middx. By special resolution, 27 June. A. J. Morison, 47 Sharps Lane, Ruislip, appointed liquidator.

BOND'S PLASTIC RUBBER CO. LTD., licensors of patent rights and dealers in plastics materials, regd. office, 166 Victoria Street, London SW1. By special resolution, 5 July. Mr. A. D. Thwaites, 166 Victoria Street, SW1, appointed liquidator.

MERCK AND CO. (GREAT BRITAIN) LTD., pharmaceutical manufacturers, regd. office, Kent House, Telegraph Street, London EC2. By special resolution, 1 July. Mr. A. W. S. Tabbernor, Kent House, EC2, appointed liquidator.

Market Reports

PRICES CONTINUE UPWARD TREND

LONDON Although there has been the usual seasonal falling off in demand, a steady movement has been maintained in most sections of the market with home industrial users taking fair quantities against contracts. Rather more activity is reported in the fertiliser trade with a fair enquiry for the compound fertilisers.

In addition to the price increases reported last week ammonium chloride is higher at £30 2s 6d per ton and sodium cyanide at £116 5s per ton. The basis price for sodium silicate in 4-ton lots is £11 17s 6d per ton while sodium sulphate quotations have been raised by 40s per ton and sodium sulphide by 50s per ton. The new price for caustic soda in 1-ton lots is £33 16s 6d and sodium bicarbonate, £18 10s.

In the coal-tar products market, a good demand continues for creosote oil, cresylic acid and the light distillates while pitch is in fair request on the home market.

MANCHESTER Heavy chemicals on the Manchester market have maintained a strong undertone pretty well throughout the range. Holiday stoppages in the cotton and other textile trades in the north-west continue to have a seasonally quietening influence on the movement of supplies, but otherwise demand for most industrial chemicals, including the alkalis, keeps steady, while shipping business continues on a satisfactory scale. Except in one or two lines like slag and the compounds, demand for fertilisers has been moderate.

GLASGOW Although there has been considerable activity in the Scottish heavy chemical market, a slight falling off has been experienced towards the end of the week due to the approaching Glasgow fair holidays. As reported last week, prices are still showing signs of an upward trend. On the agricultural side, demand has been steady, while exports remain at a good level.

"VULCAN" BRAND IRON AND STEEL CARBOY HAMPERS
SAFETY CRATES, PACKED CARBOYS
HARRIS (LOSTOCK GRALAM) LTD.
LOSTOCK GRALAM, NORTHWICH, CHESHIRE.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents),' which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 2s 6d including postage; annual subscription £6 6d.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMENDED SPECIFICATIONS

On sale 14 *August*

Treating polythene plastics preparatory to printing. Kritchever, M. F. **718 715**

On sale 21 *August*

Lubricator for die-sets or similar mechanisms. Coley Bros. (Tools), Ltd, and anr. **757 124**

ACCEPTANCES

Open to public inspection on 21 *August*

Apparatus with an atomizer for the atomization of a liquid in a reaction chamber in which the atomized liquid is dried by or otherwise reacted with a gas. Aktieselskabet Niro Atomizer. **781 522**

Synthesis of nucleoside poly-phosphates. Canadian Patents & Developments, Ltd. **781 735**

Phenothiazine derivatives and their preparation. American Cyanamid Co. **781 526**

Substituted ethylene dipiperazines. American Cyanamid Co. **781 528**

Method and apparatus for storing liquefied gases. Union Carbide & Carbon Corporation. **781 631**

Process for hydrochlorinating an unsaturated aliphatic compound. Gulf Research & Development Co. **781 529**

Water-resistant phenolic resin bonded abrasive structures. Union Carbide & Carbon Corporation. **781 351**

Ion-exchange resins, Röhm & Haas Ges. **781 400**

4-Substituted 1.2-diphenyl-3.5-dioxo-pyrazolidines and process. Geigy AG, J.R. **781 438** **781 439**

Polymerization of perfluoro-olefins. Du Pont De Nemours & Co., E. I. **781 532**

Method of producing 3, 4-diethoxyphenylacetonitrile. Miles Laboratories, Inc. **781 739**

Apparatus for storing and shipping cold boiling liquids. Constock Liquid Methane Corporation. **781 354**

Process for the preparation of silicon compounds. Kali-Chemie AG. **781 533**

Nitric acid esters of cellulose and process. Hercules Powder Co. **781 534**

Titanium alloys. Armour Research Foundation of Illinois Institute of Technology. **781 535**

Method of and apparatus for homogenizing plastic or plasticizable materials. General Tire & Rubber Co. **781 357**

Hydrogenation of unsaturated carbonyl compounds. Celanese Corporation of America. **781 405**

Process for integrating polyethylene with vinyl-type resins and integrated bodies so produced. Plastojd Corporation. **781 742**

Quaternary amino ethers. Laboratoire Sapos, and Frommel, E. **781 407**

Manufacture of sulphur dyestuffs. Cassella Farbwerke Mainkur AG. **781 408**

Desuckering compositions. Esso Research & Engineering Co. **781 636**

X-ray diffractometers. Philips Electrical Industries, Ltd. **781 638**

Vitamin-containing compositions. Nopco Chemical Co. **781 640**

Phenazine derivatives. Geigy AG., J.R. **781 543**

Soil fungicide compositions for controlling the growth of soil fungi. Olin Mathieson Chemical Corp. **781 745**

Zirconyl 2-ethylhexoate. Carlisle Chemical Works, Inc. [Divided out of 781 449.] **781 450**

Preparation of Engel's salt. Soc. D'etudes Chimiques Pour L'Industrie Et L'Agriculture. **781 364**

Production of phthalocyanine vat dyes. General Aniline & Film Corporation. **781 749**

Hardenable lacquer mixtures containing epoxy resins. Badische Anilin- & Soda-Fabrik AG. **781 412**

Process for preparing fatty acid dihydroxyalkyl amides, and products of such process. Colgate-Palmolive Co. **781 549**

Ethers and thioethers and processes for their preparation. Soc. Des Usines Chimiques Rhone-Poulenc. **781 413**

1, 2-dichloroethane. Celanese Corporation of America. **781 414**

N-Carboxy-3, 5-pyrazolidine-dione derivatives. Farbenfabriken Bayer AG. **781 551**

Process for curing polyepoxides. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. **781 416**

Sulphonamides. American Cyanamid Co. **781 418**

Production of amino-benzophenone-sulphones (amino - thioxanthone - s - dioxides). Badische Anilin- & Soda-Fabrik AG. **781 558**

Production of dry NN-diisopropyl-2-benzothiazole-sulphenamide. Goodyear Tire & Rubber Co. **781 559**

Installations for cleaning, during operation, gas-swept heating surfaces in heat-exchange apparatus. Aktiebolaget, A. Ekstroms Maskinaffar. **781 699**

Production of polymers. British Petroleum Co., Ltd., Habeshaw, J., and Rae R. W. [Divided out of 774 871.] **781 420**

Steroid compounds. Merck & Co., Inc. [Divided out of 781 422.] **781 423** **781 424**

Open to public inspection on 28 *August*

Recovery of sulphur values from waste gas as sulphuric acid. Chemiebau Dr. A. Zieren Ges. **782 011**

Propulsion means. Microcell Ltd., Denovan, A. E. C., Hodgson, D. J., and Kremer H. [Cognate application 3 204.] **781 849**

Manufacture of glycidyl ethers of phenols. Aero Research, Ltd., and Mackenzie, J. B. D. **782 072**

Countercurrent contacting of fluids. Universal Oil Products Co. **782 051**

Metal-metal oxide laminater. Michigan Bumber Corp. **781 754**

Colloidal, organic solutions from seaweeds and their dried final products, and the products obtained therewith. Tjoa, S. L. **781 970**

Water-soluble gums, or water-soluble cellulose ethers having improved properties. Hercules Powder Co. **782 014**

Radiation analysis. Distillers Co., Ltd. **781 972**

Manufacturing titanium metal with high creep resistance. Pokorny, E. A. **781 760**

Methods and apparatus for vacuum distillation. British Drug Houses. **782 073**

Refining petroleum fractions of distillate type. Compagnie Francaise De Raffinage. **782 052**

Production of 2-mercapto-6-methylpenthiazoline. Ruhrchemie AG. **782 053**

Device for testing the moisture content of grain and other compressible materials. Langmead, P. I. **781 919**

Alkylene oxide condensation products. Ciba Ltd. **781 765**

Vacuum deep-drawing of thermoplastic sheet material. Hydro-Chemie AG. **781 979**

Thermostats. Minneapolis - Honeywell Regulator Co. **781 981**

Rubber deterioration retarders. Goodrich Co., B.F. **781 768**

Preparing lubricating compositions. Esso Research & Engineering Co. **782 054**

Antistatic rubber compositions. Dunlop Rubber Co., Ltd. **781 774**

Lubricant composition. Esso Research & Engineering Co. **782 075**

Burning cement, lime and the like in shaft kilns. Portland-Zementwerke Heidelberg AG. **781 984**

Cation-exchange resins and their preparation. Permutit Co., Ltd. **781 780**

Manufacture of alkylaminobenzoic acid esters or salts thereof. Farbwerke Hoechst AG. [Addition to 717 516.] **782 055**

Anthraquinonoid dyestuffs. Imperial Chemical Industries, Ltd. **781 930**

TRADE NOTES

Jet-Lube Ltd.

A new British company, Jet-Lube Ltd., 26 Caxton Street, London SW1 has been formed to make and market throughout Europe, the Middle East and the Far East, the Jet-Lube range of extreme service lubricants, greases and grease compounds, until recently only obtainable from the US. Two brochures 'Jet-Lube for Industry' and 'Jet-Lube for Oilfields' are obtainable from the company.

New Office and Plant

Polypenco Ltd. have opened a new office and plant for Polypenco industrial plastics at 68–70 Tewin Road, Welwyn Garden City, Herts. Products include Polypenco nylon, Nylaflow pressure tubing, p.t.f.e., Q-200.5 (cross-linked polystyrene) rod and plate, K-51 (chlorinated polyether) rod, strip, tubular and bar, and Ferrotron (ferro-magnetic plastic) rigid cores and toroids, flexible rod and tape.

German Order for Power Gas

An order for over £100,000 has been received by the Power-Gas Corporation Ltd., Stockton-on-Tees, in association with the German licensees, Didier-Werke AG, Essen, for two Segas plant units, each of 30,000 cubic metres, for an East German gasworks.

AFRICAN EXPLOSIVES REPORT HIGHER SALES AND PROFITS

INCREASED manufacturing and trading profits with expansion in sales were reported by Sir Ernest Oppenheimer, chairman, of African Explosives and Chemical Industries Ltd.

For the year ended 31 December last manufacturing and trading profits of the company and its subsidiaries amounted to £3,741,109, an increase of just over £400,000 compared with 1955. The increase is attributed mainly to the start of operation during 1956 of some of the company's extensive projects, plus generally increased demands for their products. Net profits were £1,817,829. Dividend of 12½ per cent for the year was paid.

The financial results, said the chairman, reflected soundness and stability on a gradually expanding scale roughly proportional to the capital expenditure incurred in increasing the company's range of products and output capacity to meet steadily growing requirements.

Total sales of fertiliser products increased slightly during 1956. There was a noticeable change in the incidence of demand, sales of straight superphosphate being higher and sales of mixed fertilisers being lower. Certain extensions now in progress at the company's two fertiliser factories at Umbogintwini and Somerset West will bring the aggregate capacity of the two up to not less than 800,000 tons of superphosphate a year and enable the company to handle a larger tonnage of fertiliser mixtures both in powder and granular form. It is envisaged that the extensions will take care of the Union's requirements for several years ahead, particularly as the advent of superphosphate manufacture in Rhodesia next year will release output capacity at the Union factories from which hitherto superphosphate has been supplied to Central African Federation.

Good progress is reported on the construction of the new superphosphate plant together with the attendant fertiliser mixing and granulating plants being set up by the subsidiary company, A.E. and C.I. (Rhodesia) Ltd., at Rhodia near Salisbury.

There has been an appreciable increase in the company's sales of industrial chemicals, the most notable increases being due to the additional output resulting from the completion during the year of the third stage of the No. 2 ammonia plant at Modderfontein. This plant now has a capacity of 50,000 tons of ammonia, 60,000 tons of nitric acid and 100,000 tons of ammonium nitrate a year. This latter is mostly used in explosives manufacture, but a limited quantity of agricultural grade material was marketed for the first time.

Technical staff of the company are actively engaged in finalising a further major extension of ammonia capacity with the object mainly of catering for future requirements of nitrogen for agriculture.

African Explosives' new plant at Umbogintwini for the manufacture of chlorine, solvents and plastics which started up in stages towards the end of 1955 and early 1956 has operated at less than capacity due to market needs being somewhat lower than had been anticipated and to cut-price overseas competition.

The vynide division is being modernised and extended. Satisfactory operation of the older portion of the Klipspruit cyanide factory up to the limits of the methane gas available from the adjoining sewage works is reported. The new extension, however, which includes coal gasification and methane synthesis plants, has had teething problems. The subsidiary company, Rand Carbide Ltd., increased its sales locally due to an expanding demand for carbide for chemical manufacture.

Information Sought

An Irish firm of laboratory suppliers has asked us to trace the address of a firm of pressure steriliser manufacturers known as 'Bramhill Dean and Co'. Numerous enquiries have failed to trace a firm of this name. If any of our readers know of this company, it would be appreciated if they would send the address to the editor at 154 Fleet Street, London EC4.

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Particulars of the proposed amendments were set forth in the Official Journal (Patents), No. 3,569 dated 10th July, 1957.
Any person may give Notice of Opposition to the amendment by leaving Patents Form No. 36 at the Patent Office, 25 Southampton Buildings, London, W.C.2, on or before 10th August, 1957.

J. L. GIRLING, Comptroller-General.

The Proprietors of British Patent No. 707173 for **"AN IMPROVED METHOD FOR THE DEPHENOLATION OF AQUEOUS SALT SOLUTIONS BY DISTILLATION IN THE COURSE OF A PHENOL RECOVERY PROCESS",** desire to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from **MARKS & CLERK,** 57 & 58 Lincoln's Inn Fields, London, W.C.2.

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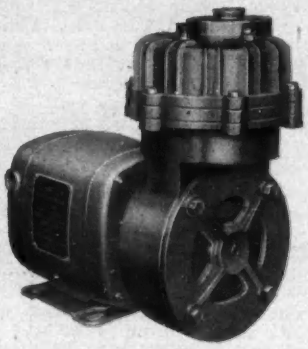

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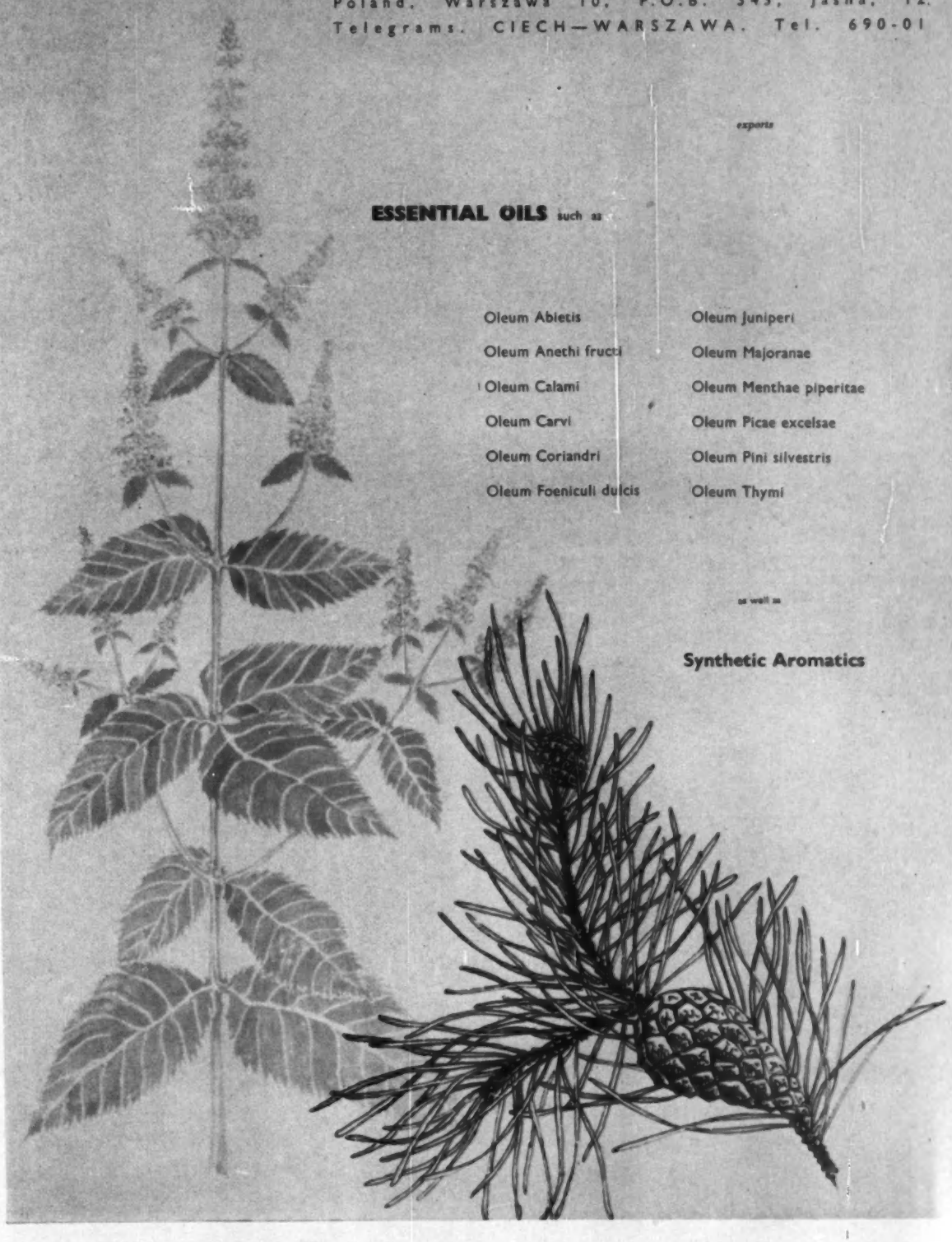

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